SECTION 5A

4T40-E AUTOMATIC TRANSAXLE

CAUTION: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

TABLE OF CONTENTS

SPECIFICATIONS

END PLAY SPECIFICATIONS

Dimension A (mm)	Washer Selection	Washer Dimension
100.40-100.70	Brown	1.50-1.60
100.70-100.99	Grey	1.80-1.90
100.99-101.29	Natural	2.09-2.19
101.29-101.59	Black	2.39-2.49
101.59-101.88	Orange	2.68-2.78
101.88-102.18	Violet	2.98-3.08
102.18-102.48	Yellow	3.28-3.38
102.48-102.77	Red	3.57-3.67
102.77-103.07	Green	3.87-3.97

TRANSAXLE GENERAL SPECIFICATIONS

Dimension A (mm)	Backing Plate Identification
8.970-9.433	A
9.434-10.007	B
10.008-10.470	C

FLUID CAPACITY

	Litres	Quarts
Bottom Pan Removal	6.5	6.9
Complete Overhaul	9.0	9.5
Dry	12.2	12.9
(Measurements are approximate)		

RANGE REFERENCE

Range	Park/ Neutral	Reverse	D				3			2			1	
Gear	N	R	1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	3rd**	1st	2nd***
1-2 Shift Solenoid	ON	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
2-3 Shift Solenoid	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
2nd Clutch	-	-	-	A	A*	A*	-	A	A*	-	A	A*	-	A
2nd Roller Clutch	-	-	-	H	O	-	-	H	O	-	H	O	-	H
Int./4th Band	-	-	-	-	-	A	-	-	-	-	A	-	-	A
Reverse Clutch	-	A	-	-	-	-	-	-	-	-	-	-	-	-
Coast Clutch	-	-	-	-	-	-	A	A	A	A	A	A	A	A
Input Sprag	-	-	H	H	H	O	H	H	H	H	H	H	H	H
Direct Clutch	-	-	-	-	A	A	-	-	A	-	-	A	-	-
Forward Clutch	-	-	A	A	A	A*	A	A	A	A	A	A	A	A
LO/Rev Band	A	A	-	-	-	-	-	-	-	-	-	-	A	-
LO Roller Clutch	-	-	H	O	O	O	H	O	O	H	O	O	H	O

A = Applied
H = Holding
O = Overrunnig
ON = The solenoid is energized.
OFF = The solenoid is de-energized.
* = Applied with no load.
** = Manual Second-Third gear is only available above approximately 100 km/h (62 mph).
*** = Manual First-Second gear is only available above approximately 60 km/h (37 mph).
NOTE: Manual First-Third gear is also possible at high vehicle speed as a safety feature.

4T40-E GEAR RATIOS

Gear	Ratio
First	2.96
Second	1.62
Third	1.00
Fourth	0.68
Reverse	2.14

SHIFT SPEED

% of TPS		1-2 Shift @ +/- 3 mph			2-3 Shift @ +/- 4 mph			3-4 Shift @ +/- 5 mph			Downshift @ +/- 4 mph			TCC Apply 4th Gear
Model	Series	10	25	50	10	25	50	10	25	50	4-3 Coast	3-2 Coast	2-1 Coast	
WKR	J	9	14.5	20	17	25	39.5	30	36	57	26	11.5	6	42
WBR	J	9	15	27	17	28	51	38	40	78	30	13	7	36

LINE PRESSURE

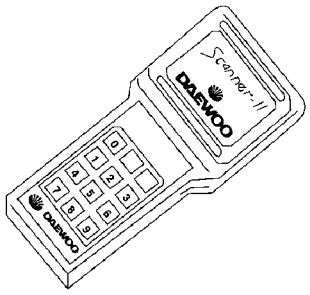
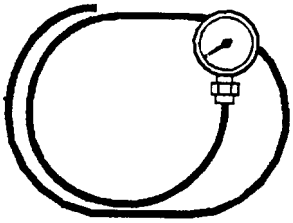
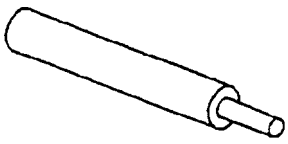
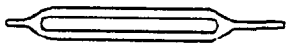
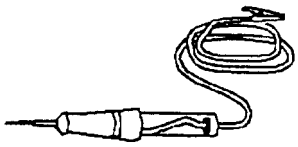
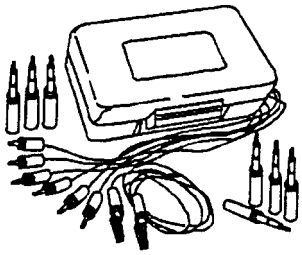
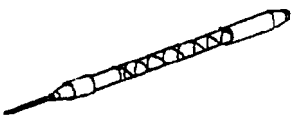
Pressure Control Solenoid Current (Amp)	Approximate Line Pressure (psi)
0.00	152-160
0.10	149-151
0.30	141-143
0.50	124-127
0.60	111-115
0.70	97-101
0.80	81-84
0.90	64-67
0.95	56-58
1.00	50-51
1.05	50
1.10	50

FASTENER TIGHTENING SPECIFICATIONS

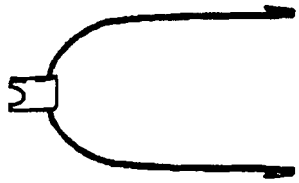
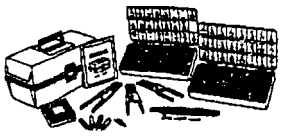
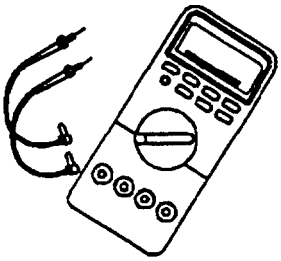
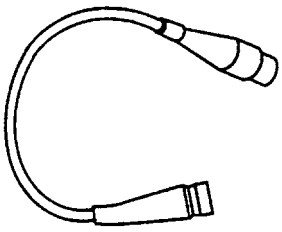
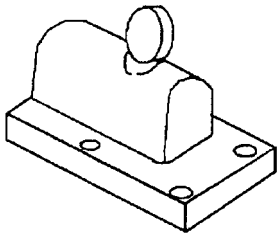
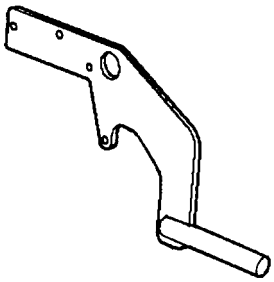
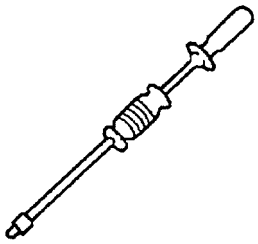
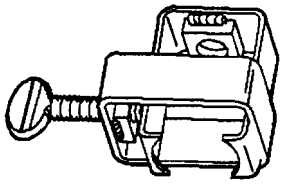
Application	N•m	Lb-Ft	Lb-In
A/T OSS Stud	12	-	106
Bell Housing Bolts	75	55	-
Channel Plate-to-Case Bolt	12	9	-
Channel Plate-to-Case Valve Body Bolts	12	-	106
Channel Plate-to-Case Valve Body Pressure Switch Manual Bolts	12	-	106
Channel Plate-to-Case Valve Body Pump Bolts	12	-	106
Channel Plate-to-Support-Driven Sprocket Bolt	14	10.5	-
Channel Plate-to-Support-Driven Sprocket Spacer Bolts	14	10.5	-
Channel Plate Valve Body Pressure Switch Manual Bolts	12	-	106
Detent-to-Channel Plate Spring & Roller Assembly	12	-	106
Drive Sprocket-to-Case Support Assembly Bolts	12	9	-
Engine Mounting Bolts	75	55	-
Floor Bracket Bolt	8	-	71
Fluid Level Plug	12	-	106
Flywheel Bolts	65	48	-
Frame Bolts	75	55	-
Input Speed Sensor Bolt	12	-	106
Oil Pipe Bolts	12	9	-
Pivot Bolt	65	48	-
Servo Cover Bolts	12	-	106
Side Cover Bolts	20	15	-
Shift Control Cable Adjuster Pinch Bolt	8	-	71
Side-to-Case (Stud) Cover	20	15	-
Speed Sensor Stud	12	9	-
Transaxle Mount Bolts	75	55	-
Transaxle Mounting Bracket Bolt	75	55	-
Transaxle Pan Bolts	12	-	106
Trans Oil-to-Cover LO/Reverse Servo Tube Assembly	12	-	106
Trans Oil-to-Support Forward Clutch Tube Assembly	12	-	106
Valve Body-to-Channel Plate Bolts	12	-	106
Valve Body-to-Channel Plate Pump Bolts	12	-	106
Wiring Harness Clip	12	9	-

SPECIAL TOOLS

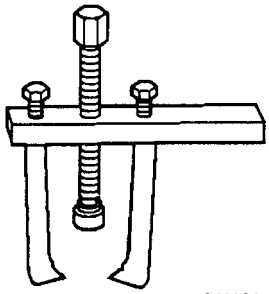
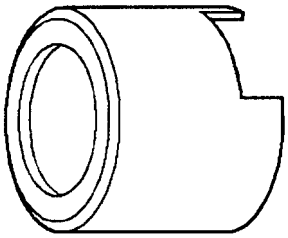
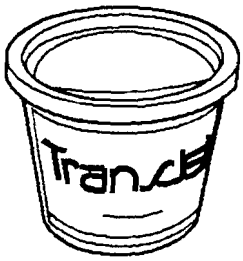
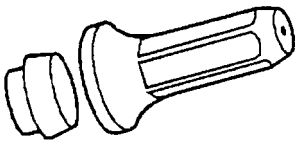
SPECIAL TOOLS TABLE

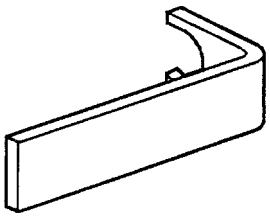
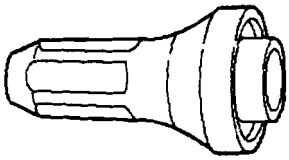
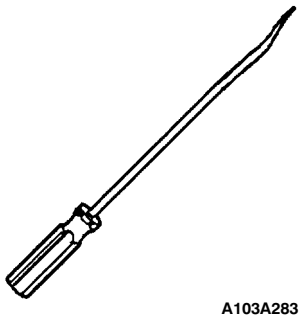
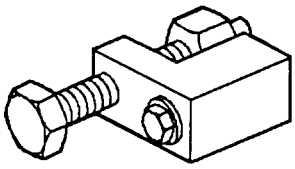
 A110B003	Tech 2 Scan Tool
 A103A263	J 21867 Universal Pressure Gauge Set
 A103A264	J 28742-A Weather Pack Terminal Remover
 A103A265	J 33095 Control Module Connector Terminal Remover
 A103A266	J 34142-B Universal Test Lamp
 A103A267	J 35616 Connector Test Adapter Kit
 A103A268	J 35689-A Metri-pack Terminal Remover

SPECIAL TOOLS TABLE (Cont'd)

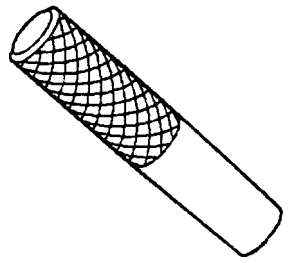
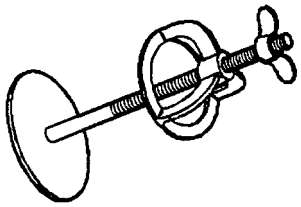
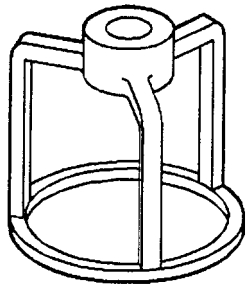
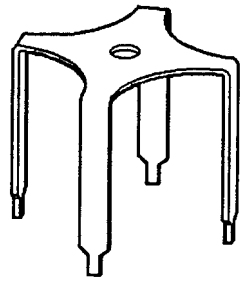
 A103A269	**J 36169-A Fused Jumper Wire**
 A103A270	**J 38125-4 Terminal Repair Kit**
 A103A271	**J 39200 Digital Volt-Ohmmeter (DVOM)**
 A103A272	**J 39775 Jumper Harness**
 A103A273	**J 3289-20 Transmission Holding Fixture Base**
 A103A274	**J 41230 Transmission Holding Fixture**
 A103A275	**J 6125-1B Slide Hammer**
 A103A276	**J 38868 Stub Shaft Sleeve Remover**

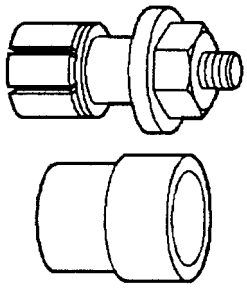
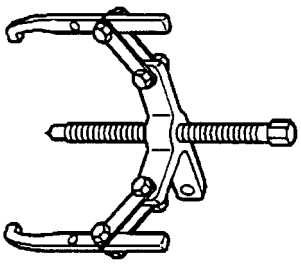
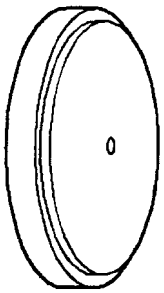
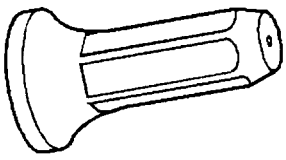
SPECIAL TOOLS TABLE (Cont'd)

 A103A277	**J 41227 Output Shaft Sleeve Remover**
 A103A278	**J 41101 Pass Through Connector Remover**
 A103A279	**J 36850 Assembly Lubricant**
 A103A280	**J 41102 Axle Seal Installer**

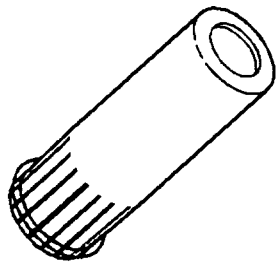
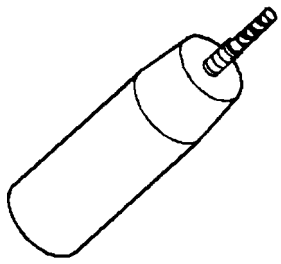
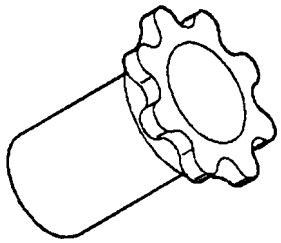
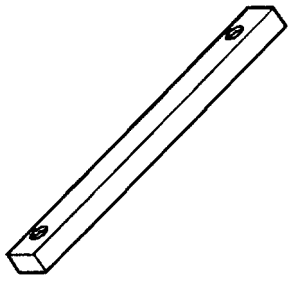
 A103A281	**J 41239-2 Cooler Line Seal Remover**
 A103A282	**J 28540-A Torque Converter Seal Installer**
 A103A283	**J 28585 Snap Ring Screwdriver**
 A103A284	**J 41239-1 Cooler Line Seal Installer**

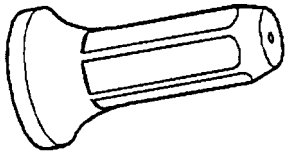
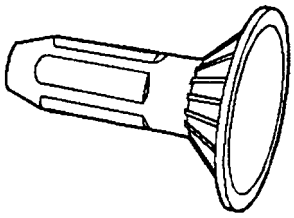
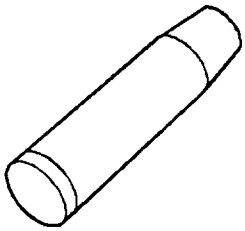
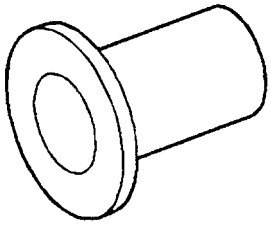
SPECIAL TOOLS TABLE (Cont'd)

 A103A285	**J 41229 Manual Shaft to Case Pin**
 A103A286	**J 23327 Clutch Spring Compressor**
 A103A287	**J 41236 Coast Clutch Return Spring Compressor Adapter**
 A103A288	**J 41232 Direct Reverse, Second Clutch Return Spring Compressor Adapter**

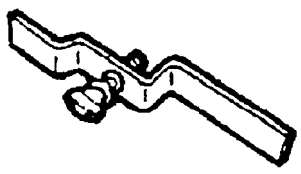
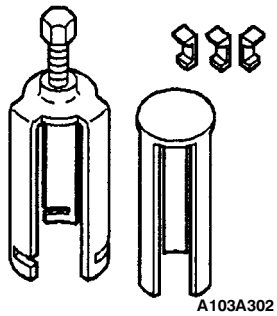
 A103A289	**J 41228 Stub Shaft Sleeve Installer**
 A103A290	**J 25031-A Forward and Reverse Clutch Inner Seal Assembly Remover**
 A103A291	**J 41097-2 Inner Seal Assembly Remover - Disc**
 A103A292	**J 41231 Forward Clutch Inner Seal Assembly Installer**

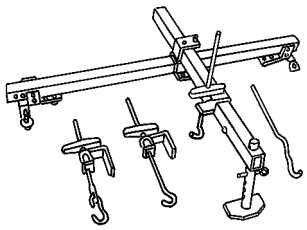
SPECIAL TOOLS TABLE (Cont'd)

 A103A293	**J 41234-1 Input Shaft Seal Installer Pusher**
 A103A294	**J 41234-2 Input Shaft Seal Installer Protector**
 A103A295	**J 41234-3 Input Shaft Seal Installer Sizer**
 A103A296	**J 34673 Input Shaft End Play Gauge Block**

 A103A297	**J 41233 Reverse Clutch Inner Seal Installer**
 A103A298	**J 41235 Second Roller Clutch Installer**
 A103A299	**J 29569-1/J 29829-1 Turbine Shaft Seal Installer**
 A103A300	**J 29569-2/J 29829-2 Turbine Shaft Seal Sizer**

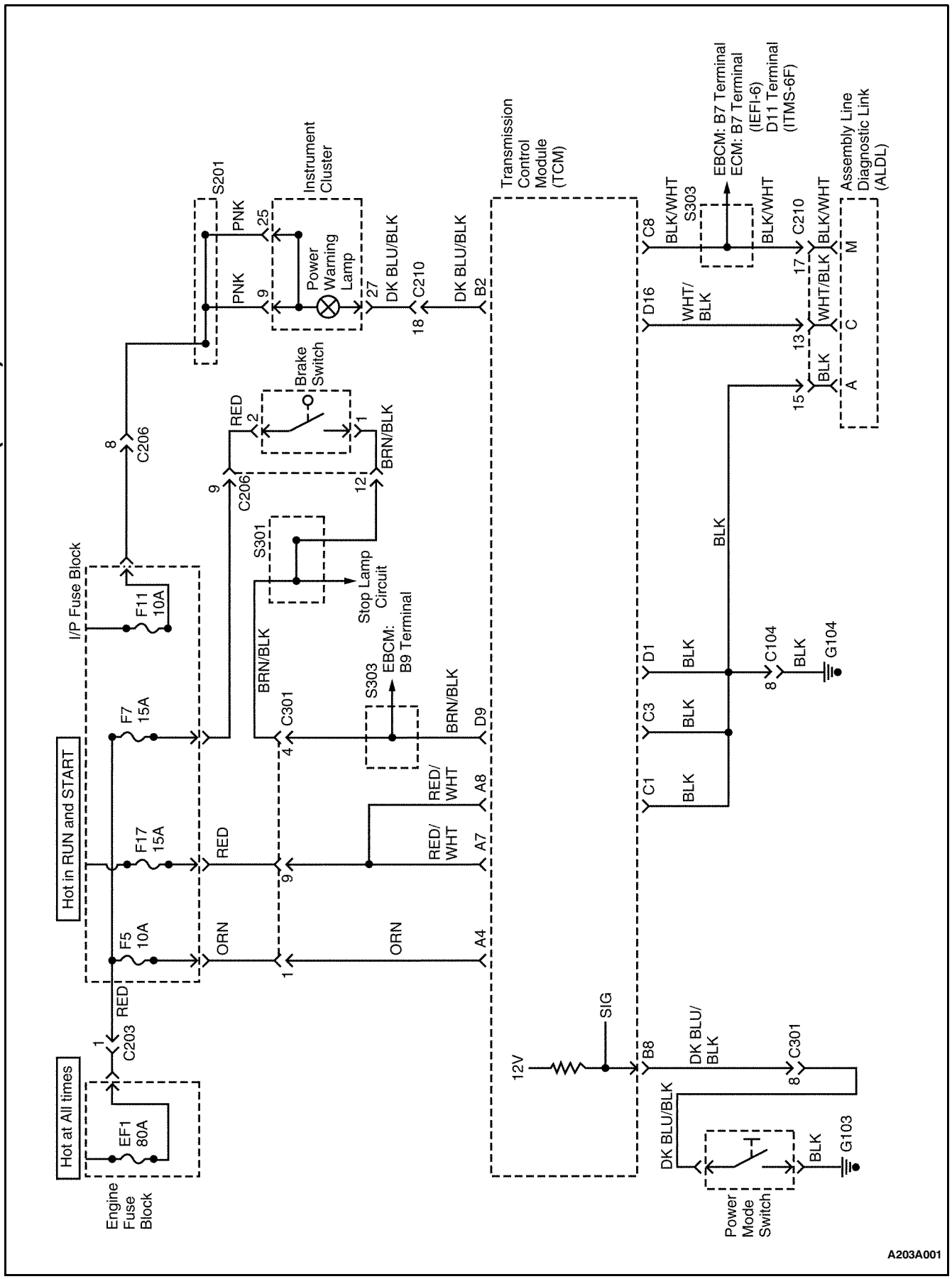
SPECIAL TOOLS TABLE (Cont'd)

 A103A301	**J 21366 Torque Converter Holding Strap**
 A103A302	**J 41103 Torque Converter Seal Remover Set**

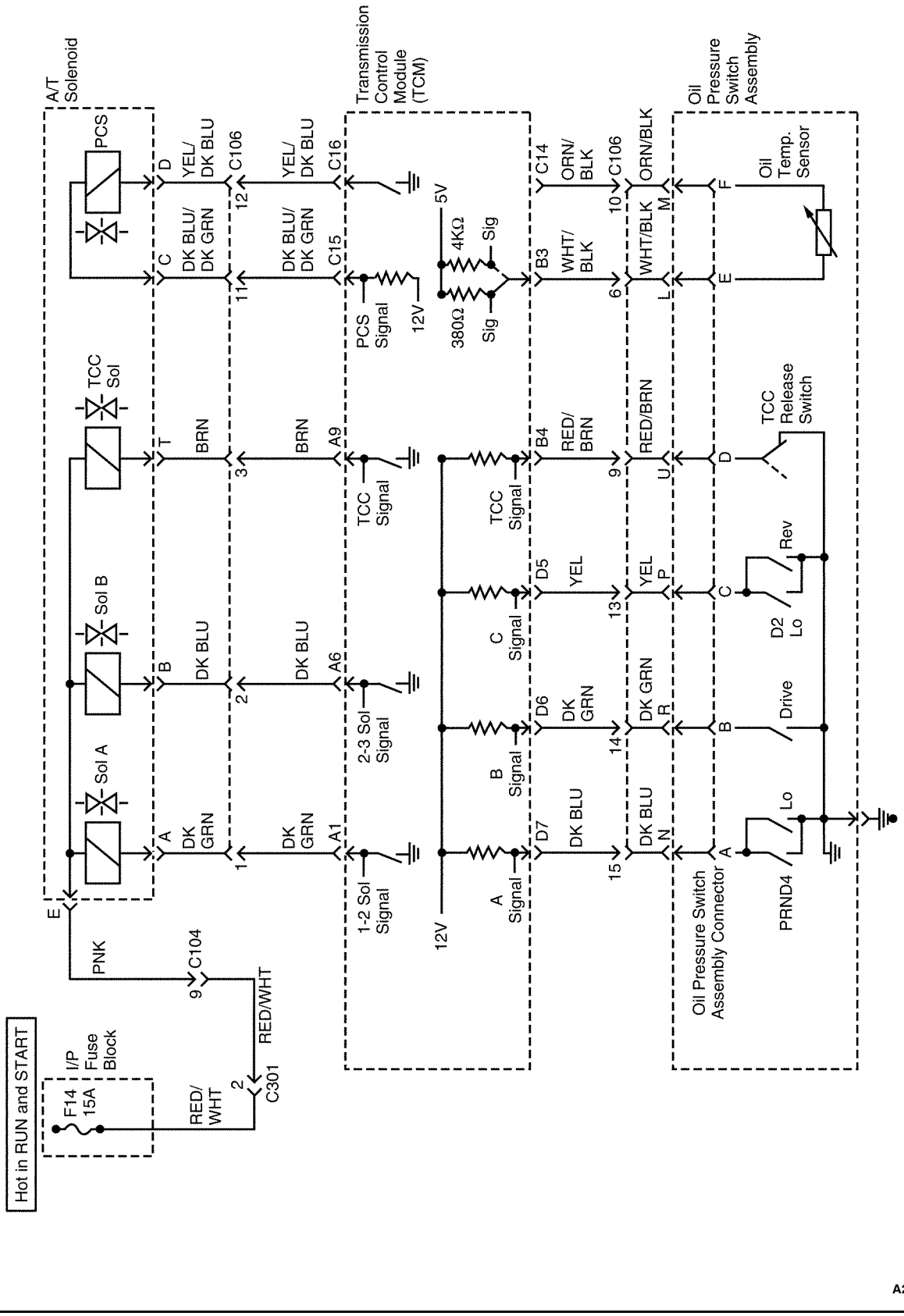
 A102B152	**J 28467-B Engine Support Fixture**

SCHEMATIC AND ROUTING DIAGRAMS

TRANSMISSION CONTROL MODULE (1 OF 4)

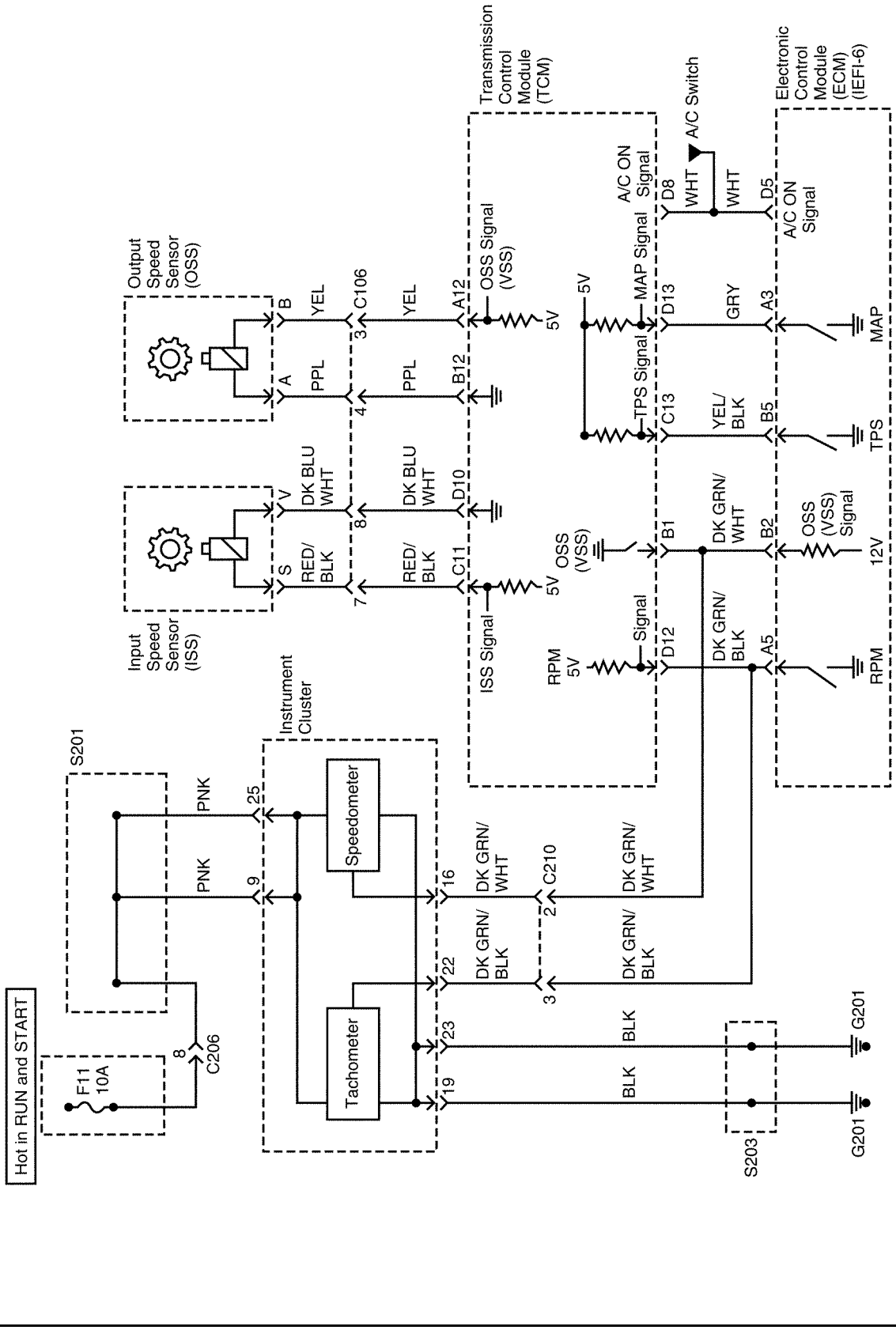


TRANSMISSION CONTROL MODULE (2 OF 4)



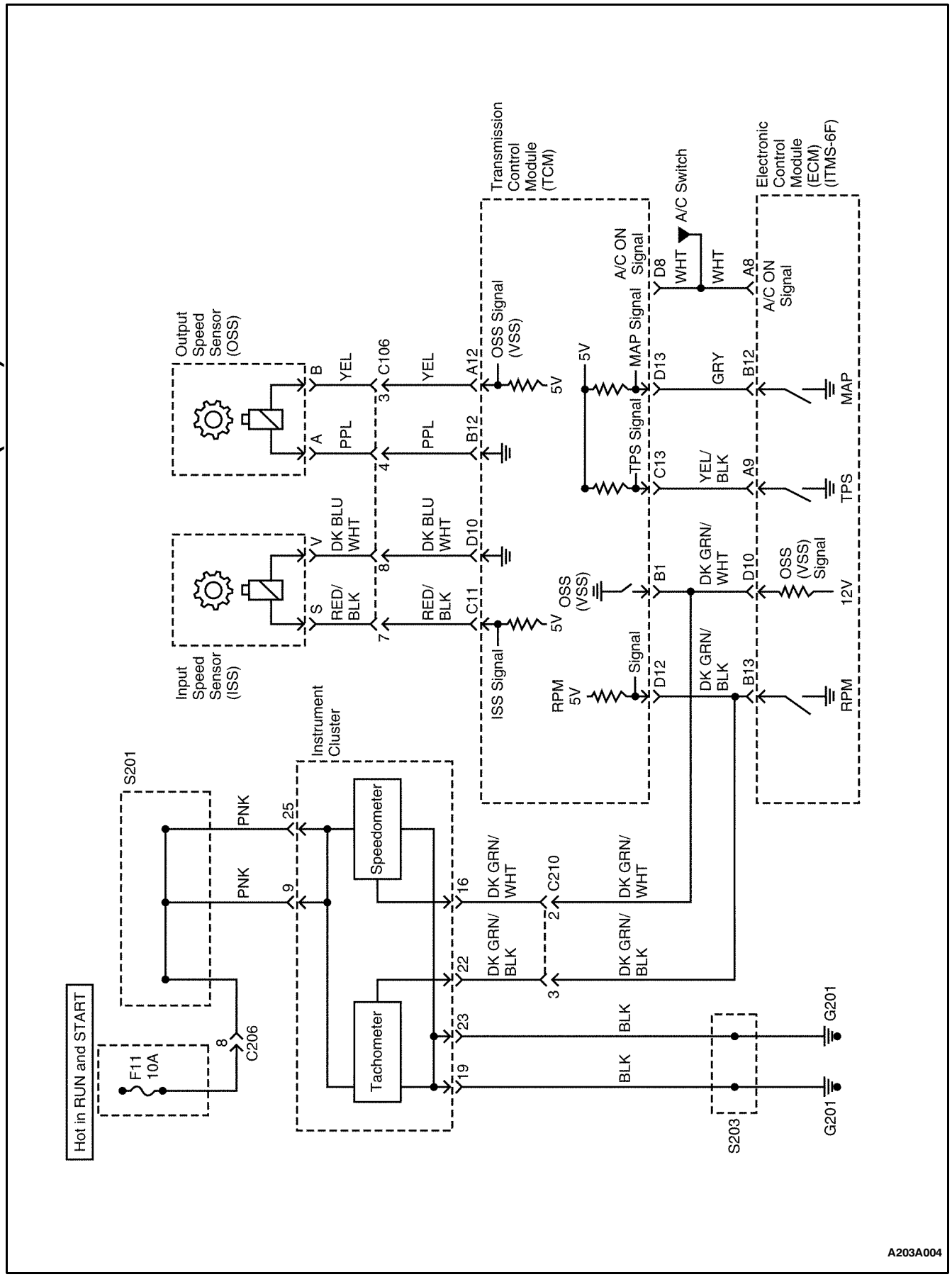
A203A002

TRANSMISSION CONTROL MODULE (3 OF 4)



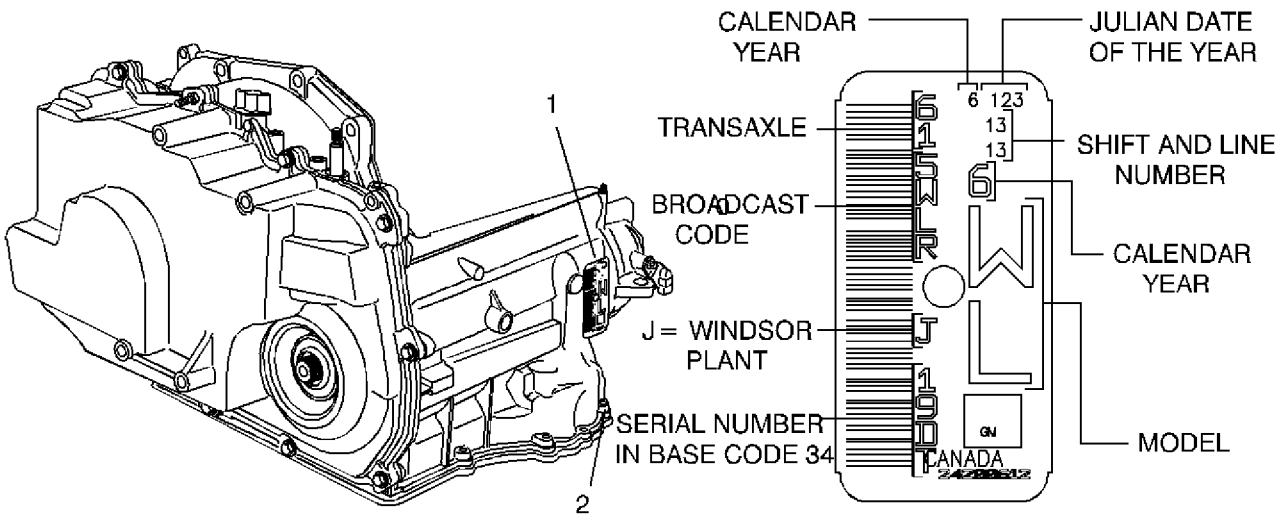
A203A003

TRANSMISSION CONTROL MODULE (4 OF 4)



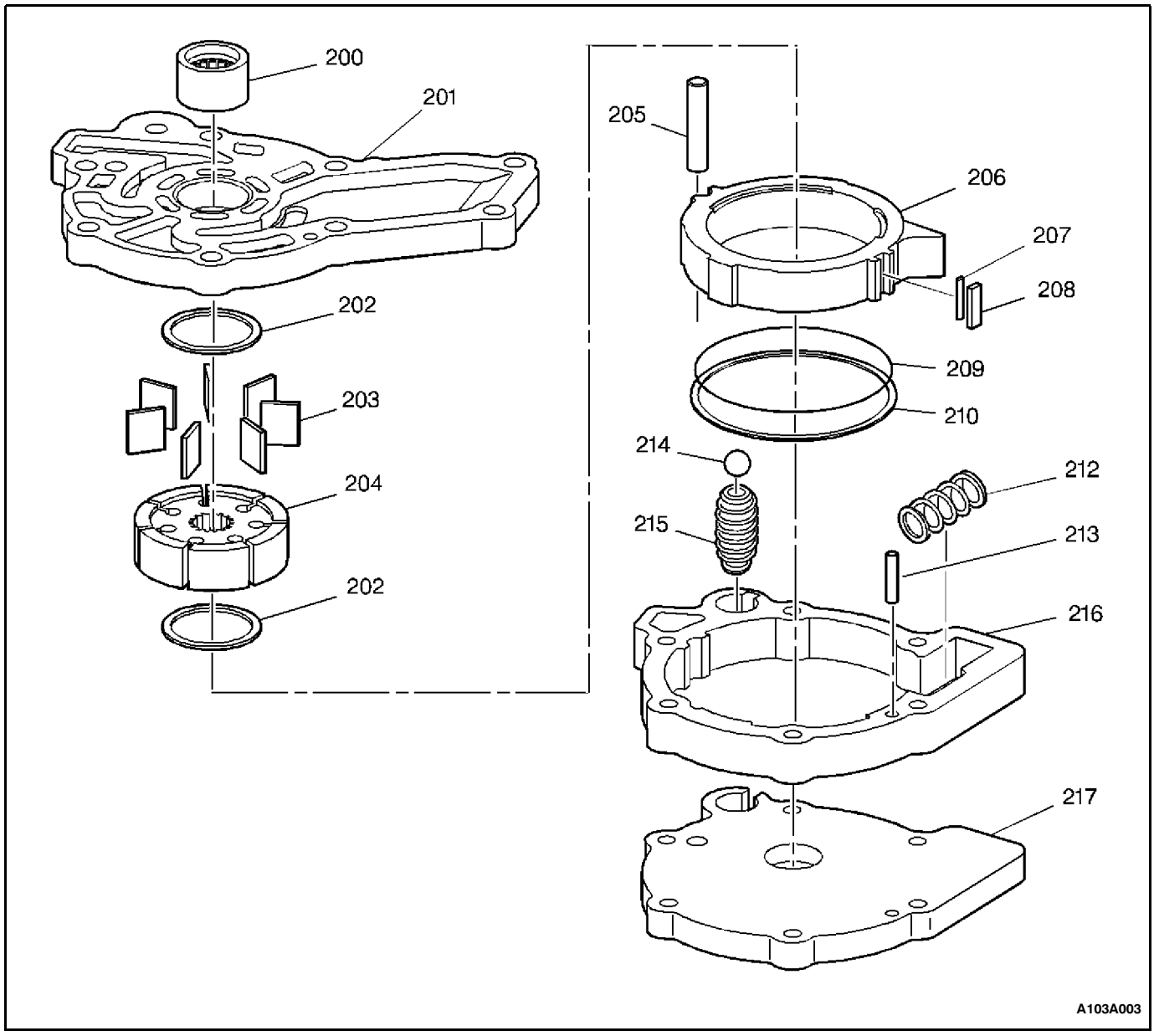
VISUAL IDENTIFICATION

TRANSAXLE IDENTIFICATION INFORMATION



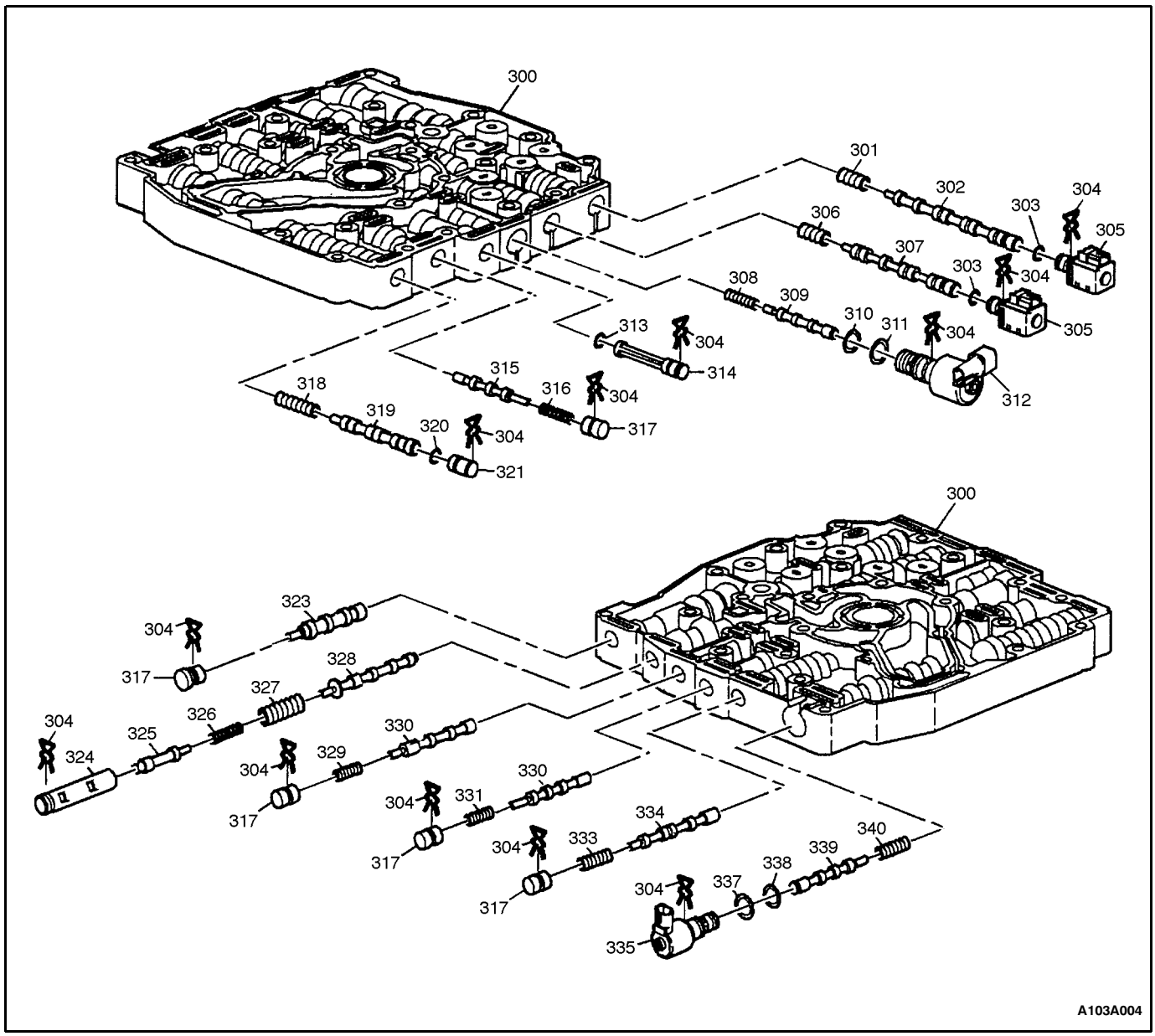
COMPONENT LOCATOR

OIL PUMP ASSEMBLY



200 Oil Pump Bearing and Seal Assembly
201 Oil Pump Base
202 Oil Pump Vane Ring
203 Oil Pump Vane
204 Oil Pump Rotor
205 Pivot (Oil Pump Slide Pin)
206 Oil Pump Slide
207 Oil Pump Slide Seal Support
208 Oil Pump Slide Seal
209 O-Ring (Oil Pump Slide) Seal
210 Fluid Seal (Slide-to-Body) Ring
212 Oil Pump Priming Spring
213 Locating Pin
214 Pressure Relief Ball
215 Pressure Relief Spring
216 Oil Pump Body
217 Pump Cover

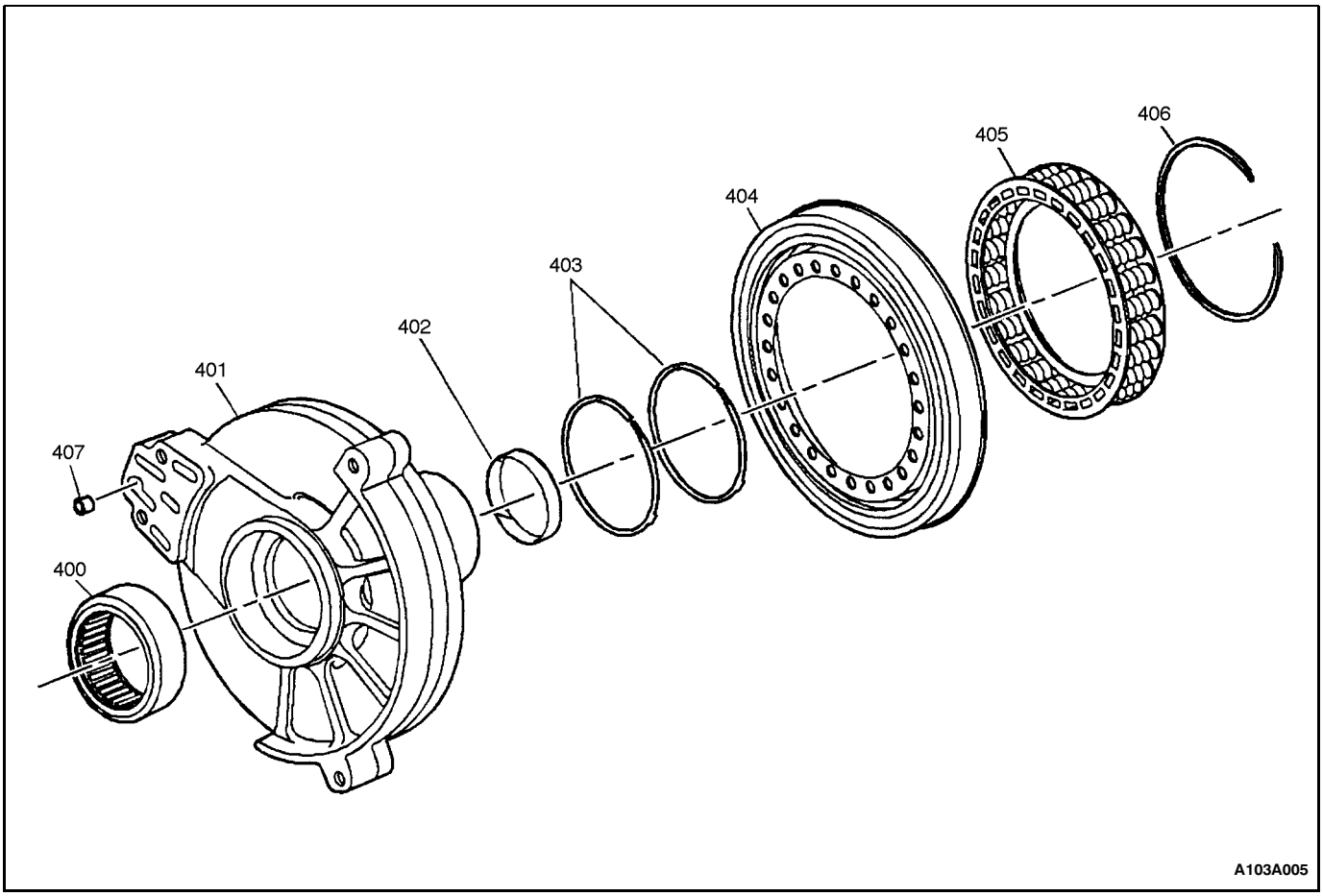
CONTROL VALVE BODY ASSEMBLY



300 Control Valve Assembly Body
301 1-2 Shift Valve Spring
302 1-2 Shift Valve
303 Shift Solenoid A and B O-Ring
304 Retainer Clip
305 Shift (A and B) Solenoid
306 2-3 Shift Valve Spring
307 2-3 Shift Valve
308 Torque Signal Regulator Valve Spring
309 Torque Signal Regulator Valve
310 Pressure Control Solenoid O-Ring
311 Pressure Control Solenoid O-Ring
312 Pressure Control Solenoid
313 Actuator Oil Filter O-Ring
314 Actuator Oil Filter
315 Actuator Feed Limit Valve
316 Actuator Feed Limit Valve Spring
317 Bore Plug
318 3-4 Shift Valve Spring
319 3-4 Shift Valve
320 3-4 Shift Valve Plug O-Ring
321 Bore Plug
323 1-2/3-4 Accumulator Valve
324 Pressure Regulator Boost Bushing
325 Pressure Regulator Boost Valve
326 Isolator Spring
327 Pressure Regulator Valve Spring
328 Pressure Regulator Valve
329 2-3 Accumulator Valve Spring
330 2-3 Accumulator Valve

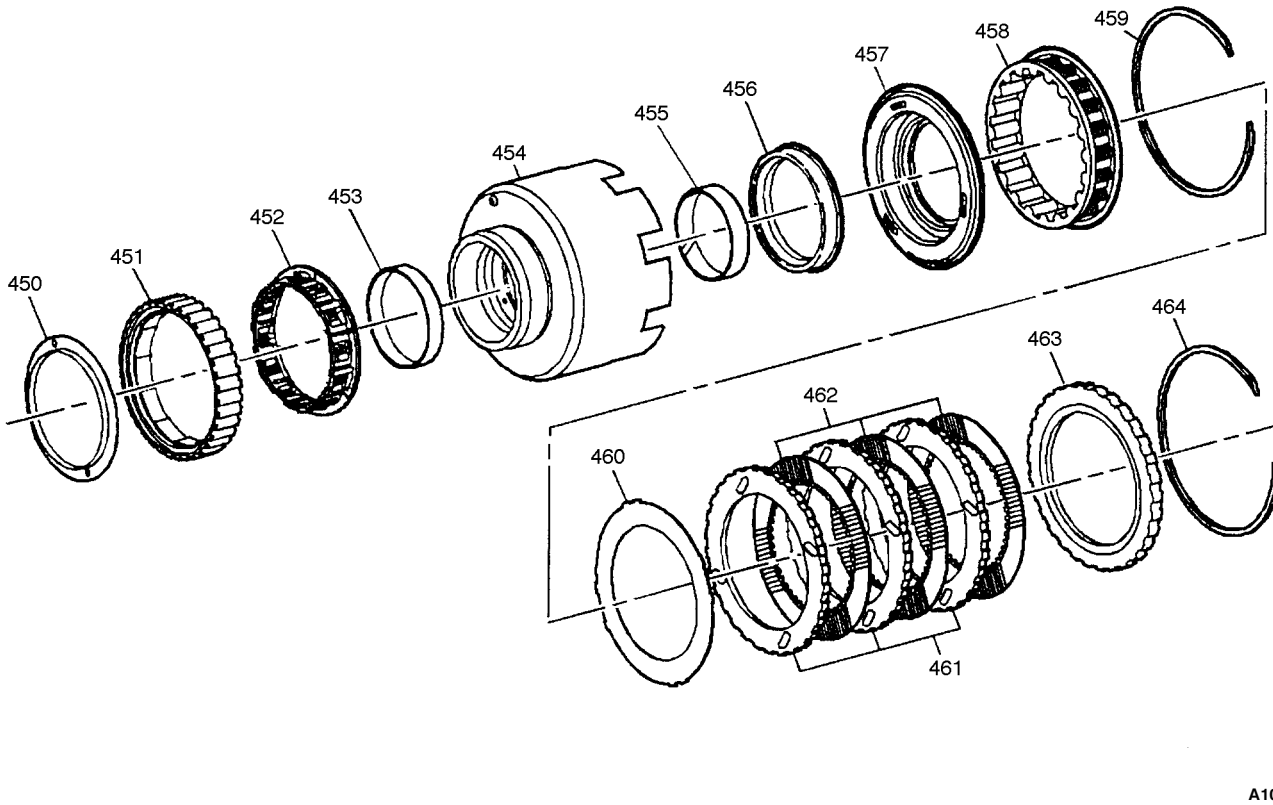
331 TCC Feed Limit Valve Spring
332 TCC Feed Limit Spring
333 TCC Control Valve Spring
334 TCC Control Valve
335 TCC Control Solenoid
337 TCC Control Solenoid O-Ring
338 TCC Control Solenoid O-Ring
339 TCC-Regulated Apply Valve
340 TCC-Regulated Apply Valve Spring

DRIVEN SPROCKET SUPPORT ASSEMBLY/2ND CLUTCH



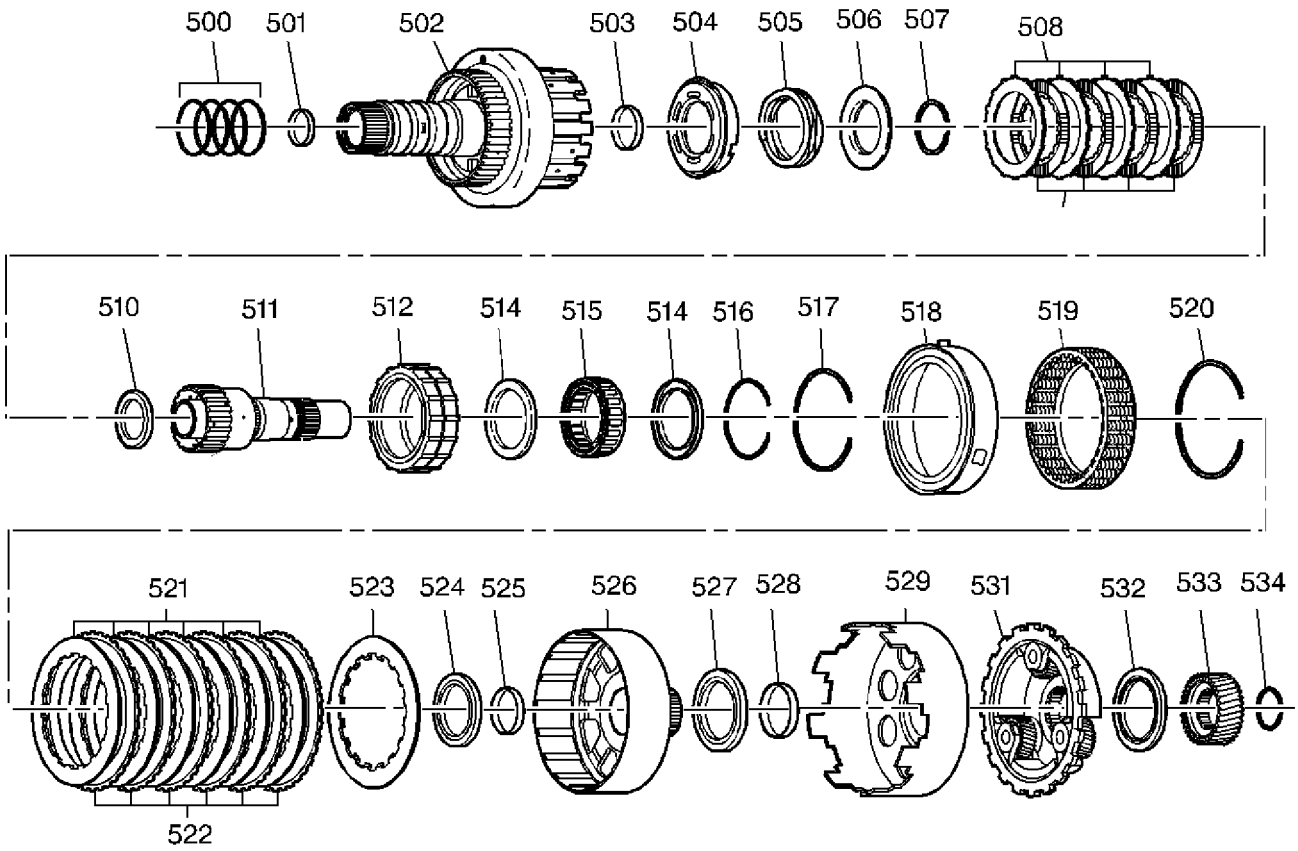
400 Driven Sprocket Support Bearing
401 Driven Sprocket Support
402 Driven Sprocket Support Bushing
403 Oil Seal Ring
404 2nd Clutch Piston Assembly
405 2nd Clutch Spring Assembly
406 2nd Clutch Spring Retaining Ring
407 Reverse Intermediate Clutch Housing Valve Assembly

REVERSE INPUT CLUTCH ASSEMBLY



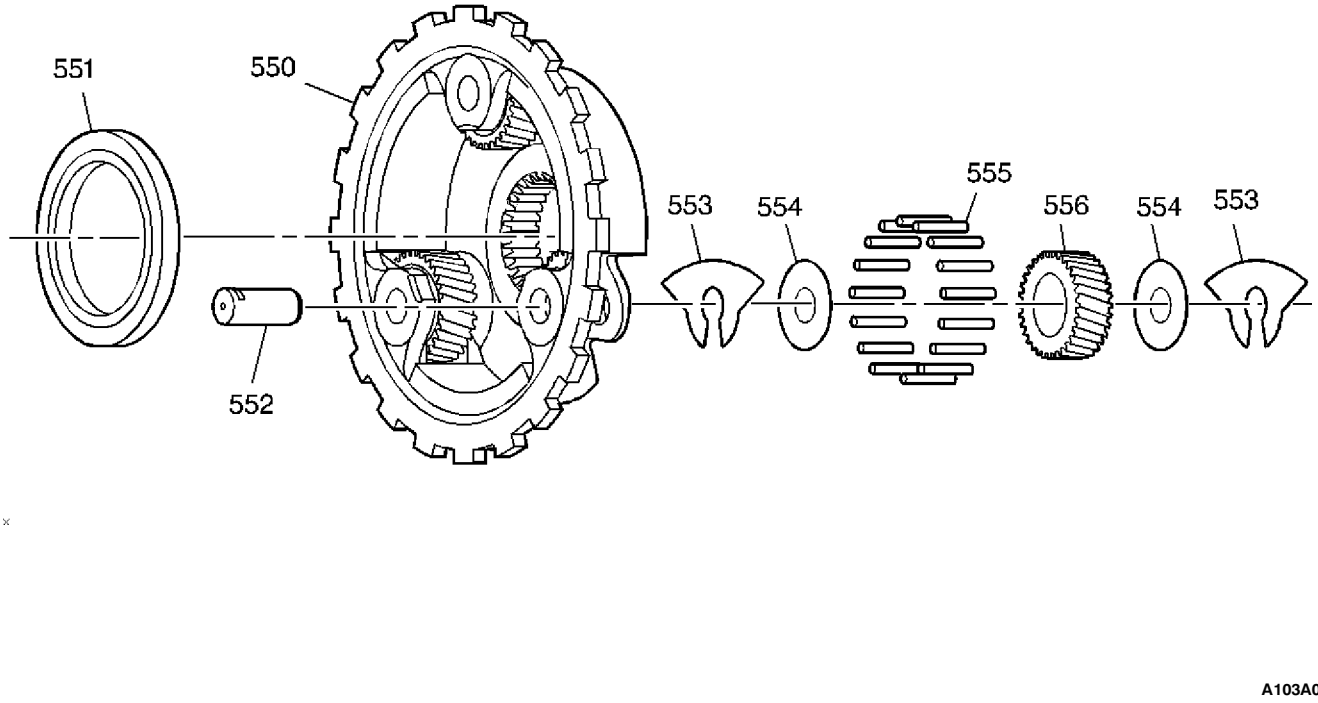
450 2nd Roller Clutch Retainer
451 2nd Roller Clutch Cam
452 2nd Roller Clutch Assembly
453 Reverse Clutch Bushing
454 Reverse Clutch Housing
455 Reverse Clutch Bushing
456 Reverse Clutch Center Retainer and Seal Assembly
457 Reverse Clutch Piston Assembly
458 Reverse Clutch Spring and Retainer Assembly
459 Snap (Reverse Clutch Spring Retainer) Ring
460 Reverse Clutch (Waved) Plate
461 Reverse Clutch (Steel) Plate
462 Reverse Clutch (Fiber) Plate
463 Reverse Clutch (Backing) Selective Plate
464 Snap (Reverse Clutch) Ring

DIRECT AND COAST CLUTCH ASSEMBLIES



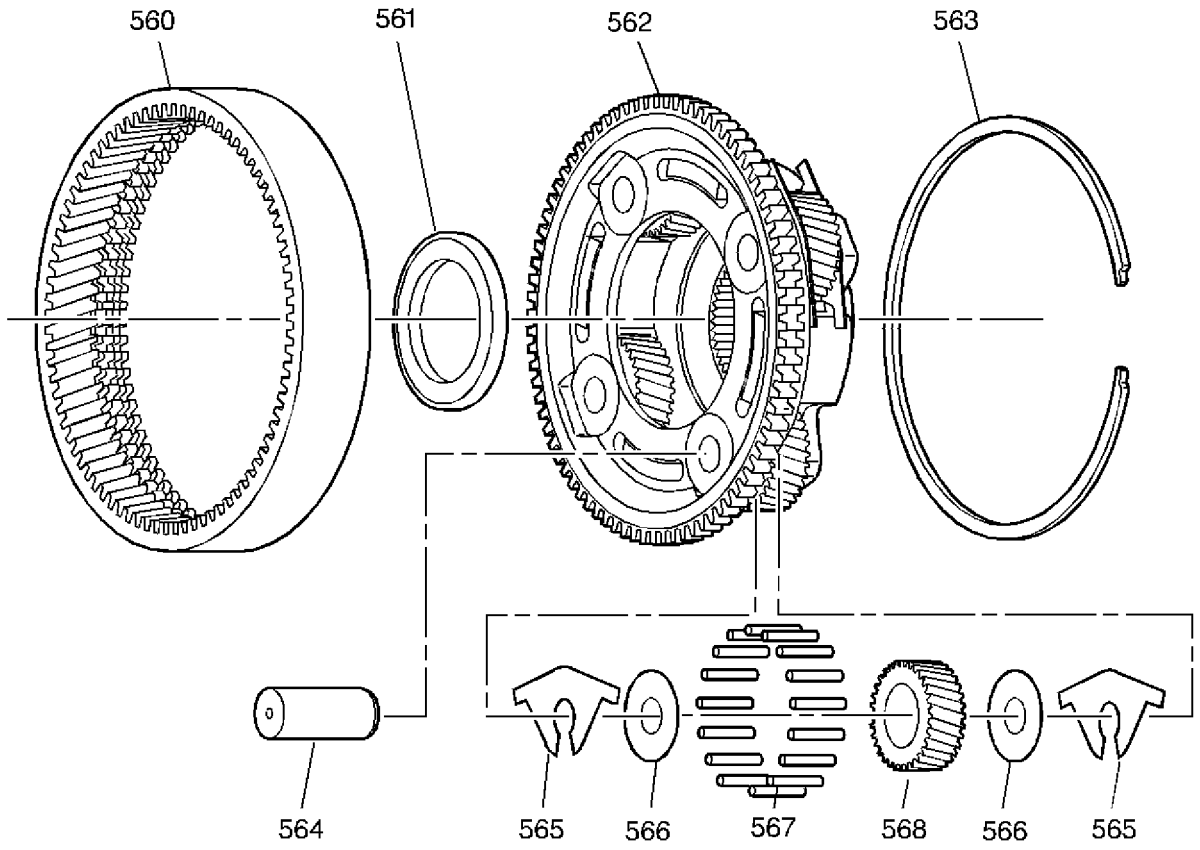
500 Oil Seal - Input Shaft Ring
501 Input Shaft Bushing
502 Direct and Coast Clutch and Input Shaft
503 Direct Clutch Housing-to-Output Shaft
504 Coast Clutch Piston Assembly
505 Coast Clutch Release Spring
506 Coast Clutch Spring Retainer
507 Snap (Coast Clutch Spring Retainer) Ring
508 Coast Clutch (Steel) Plate
509 Coast Clutch (Fiber) Plate
510 Thrust Bearing
511 Input Sun Gear Shaft and Inner Race Assembly
512 Outer (Input Sprag) Race
514 Sprag Clutch (2) End Bearings
515 Input Sprag Assembly
516 Snap (Outer Race-to-Sprag Assembly) Ring
517 Snap (Direct/Coast Clutch Retaining) Ring
518 Direct Clutch Piston Assembly
519 Direct Clutch Spring and Retainer Assembly
520 Direct Clutch Spring Retainer Ring
521 Direct Clutch (Steel) Plate
522 Direct Clutch (Fiber) Plate
523 Direct Clutch (Backing) Plate
524 Thrust Bearing
525 Reaction Carrier Shaft Bushing
526 Reaction Carrier Shaft Shell
527 Thrust (Carrier Shaft-to-Shell) Bearing
528 Reaction Sun Gear Bushing
529 Reaction Sun Shell
531 Reaction Carrier Assembly
532 Thrust (Reaction Carrier-to-Sun Gear) Bearing
533 Input Sun Gear
534 Snap Ring

REACTION CARRIER ASSEMBLY



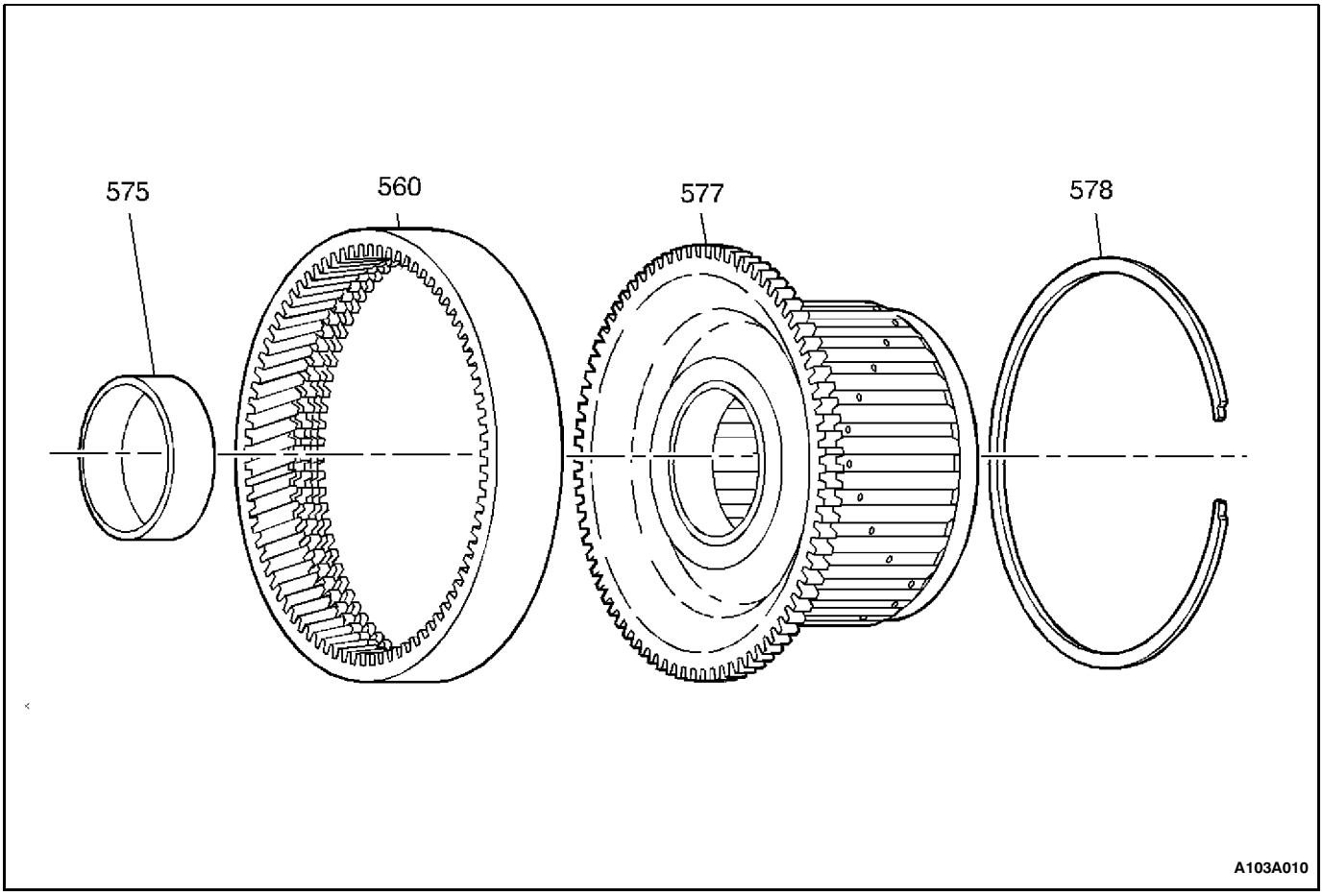
550 Reaction Carrier
551 Thrust Bearing
552 Planet Pinion Pin
553 Pinion Thrust Reaction Washer
554 Pinion Thrust Inner Washer
555 Roller Needle Bearing
556 Reaction Planet Pinion

INPUT CARRIER ASSEMBLY



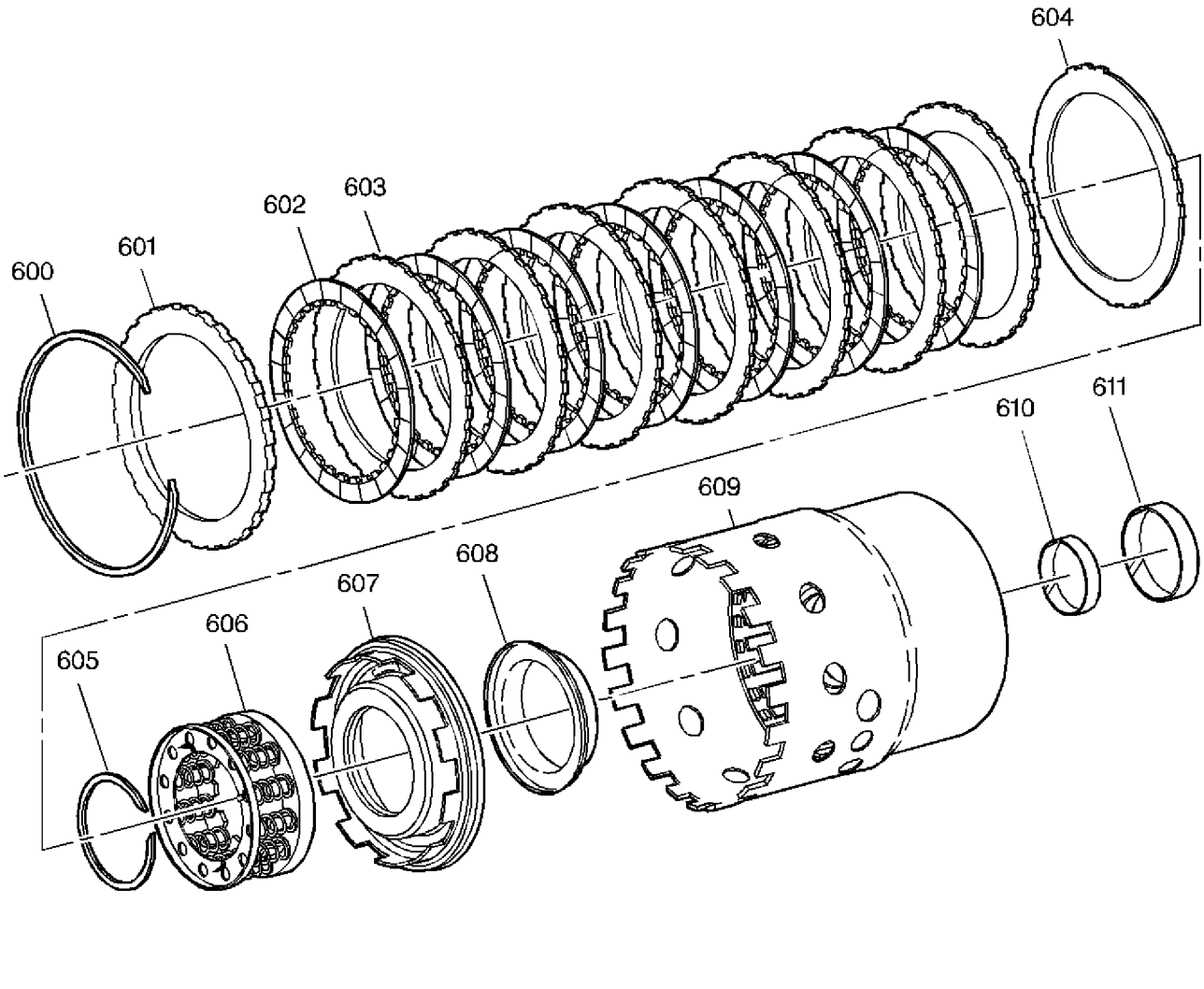
560 Internal (Input and Reaction) Gear
561 Thrust Bearing
562 Input Carrier
563 Snap (Input Carrier-to-Internal Gear) Ring
564 Planet Pinion Pin
565 Pinion Thrust Input Washer
566 Pinion Thrust Inner Washer
567 Roller Needle Bearing
568 Pinion Gear

INPUT INTERNAL GEAR AND FORWARD CLUTCH HUB



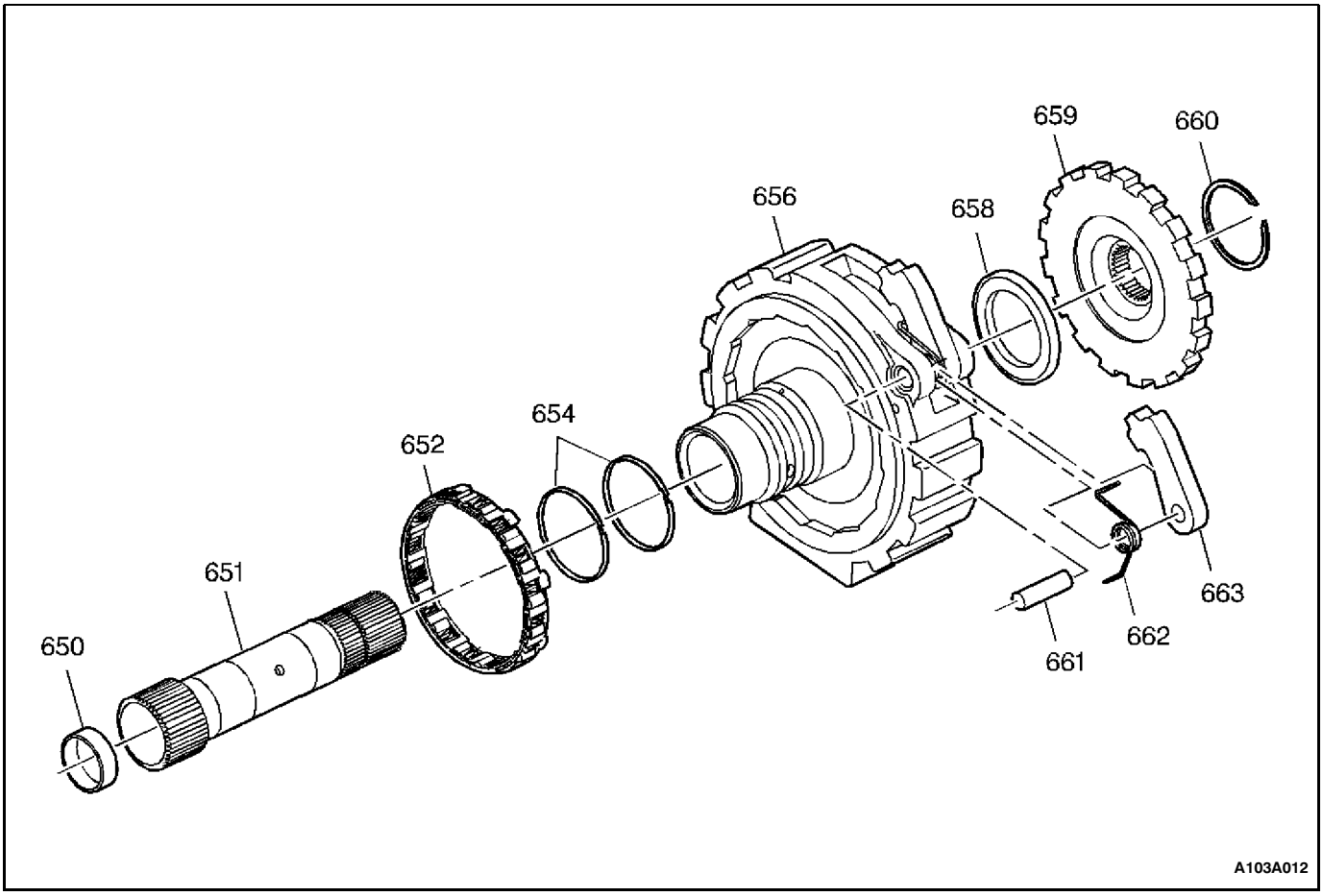
560 Internal (Input and Reaction) Gear
575 Input Flange Bushing
577 Input Flange and Forward Clutch Hub
554 Snap (Input Internal Gear-to-Input Flange) Ring

FORWARD CLUTCH ASSEMBLY



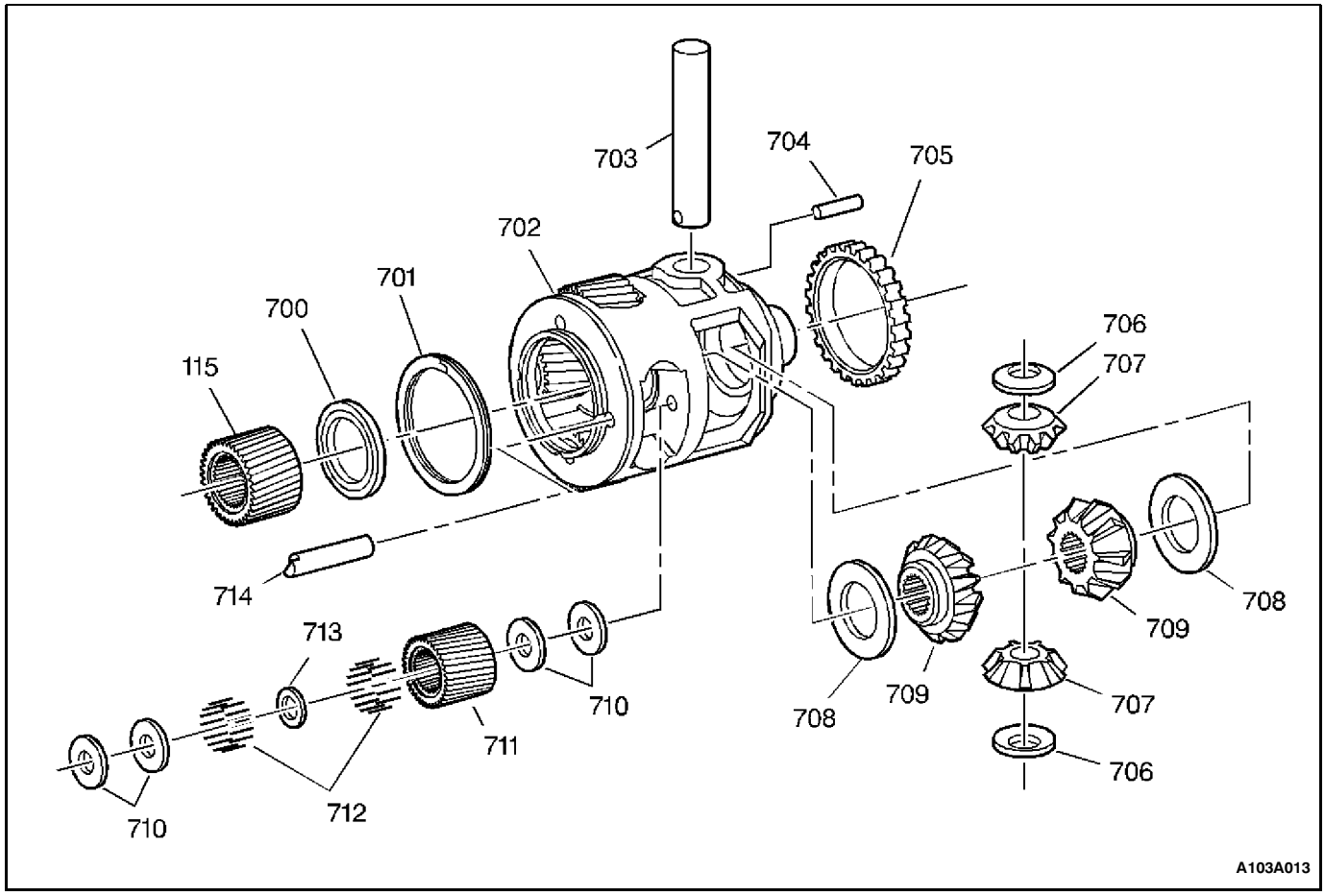
600 Snap (Forward Clutch) Ring
601 Forward Clutch (Backing) Plate
602 Forward Clutch (Fiber) Plate
603 Forward Clutch (Steel) Plate
604 Forward Clutch (Waved) Plate
605 Snap (Forward Clutch Spring Assembly) Ring
606 Forward Clutch Return Spring Assembly
607 Forward Clutch Piston Assembly
608 Forward Clutch Inner Seal and Sleeve Assembly
609 Forward Clutch Housing
610 Forward Clutch Support Bushing
611 Forward Clutch Support Bushing

FORWARD CLUTCH SUPPORT ASSEMBLY



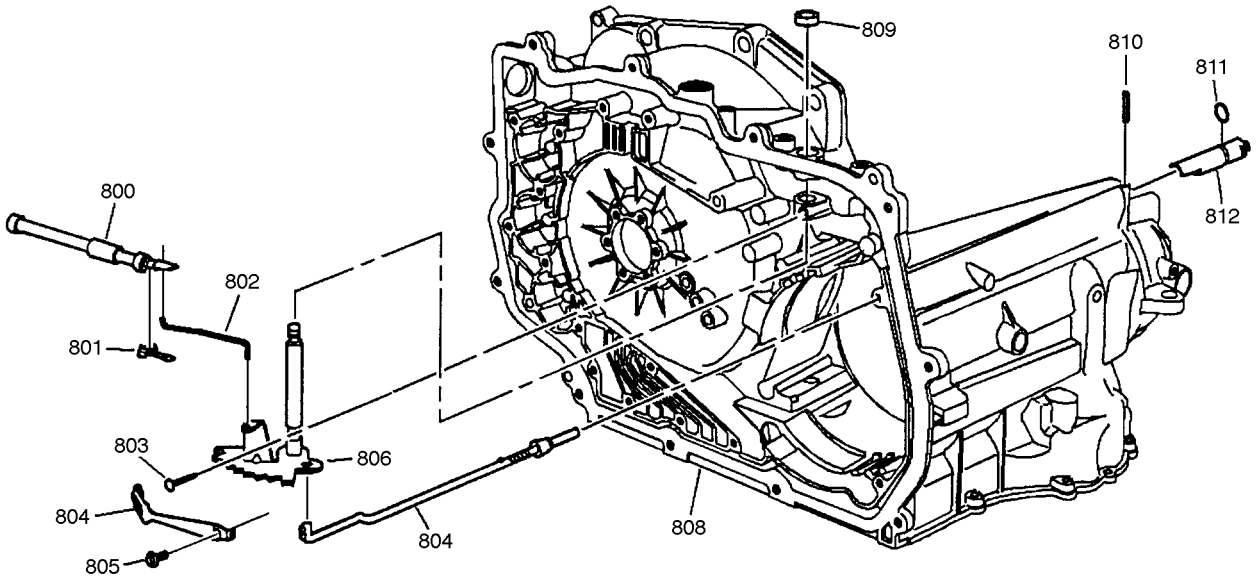
650 Final Drive Sun Shaft Bushing
651 Final Drive Sun Shaft
652 Lo Roller Clutch Assembly
654 Oil Seal (Forward Clutch Support) Ring
656 Forward Clutch Support
658 Thrust (Forward Support-to-Park Gear) Bearing
659 Park Lock Gear
660 Snap (Final Drive Sun Shaft) Ring
661 Parking Lock Pawl Shaft
662 Parking Lock Pawl Return Spring
663 Parking Lock Pawl

FINAL DRIVE AND DIFFERENTIAL ASSEMBLY



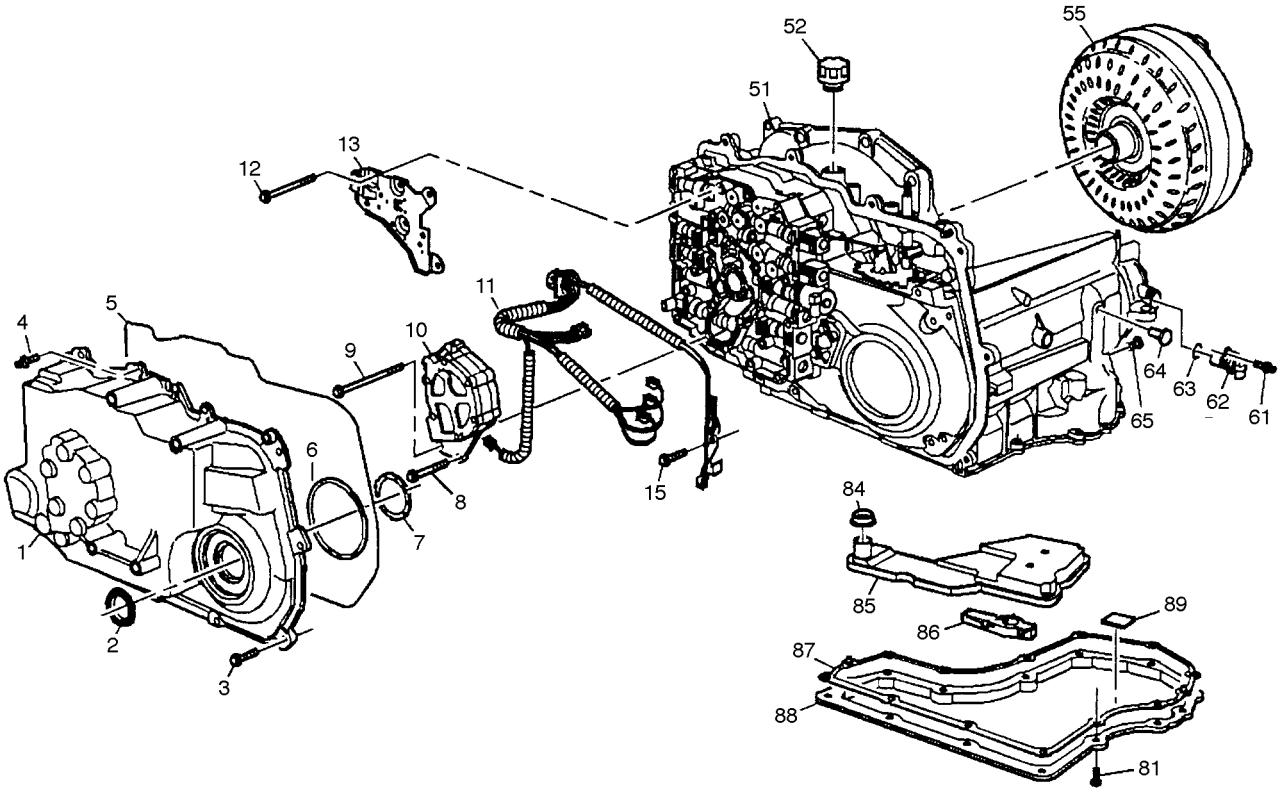
700 Thrust Bearing
701 Spiral Pin Retaining Ring
702 Differential and Final Drive Carrier
703 Differential Pinion Shaft
704 Differential Pinion Shaft Retaining Pin
705 Speed Sensor Rotor
706 Thrust (Differential Pinion) Washer
707 Differential Pinion Gear
708 Thrust Differential Side Gear Washer
709 Differential Slide Gear
710 Pinion Thrust Washer
711 Pinion (Final Drive Planet) Gear
712 Roller Needle Bearing
713 Pinion Needle Bearing Spacer
714 Pin, Planet Pinion Gear

MANUAL SHAFT, PARKING PANEL AND ACTUATOR ASSEMBLY



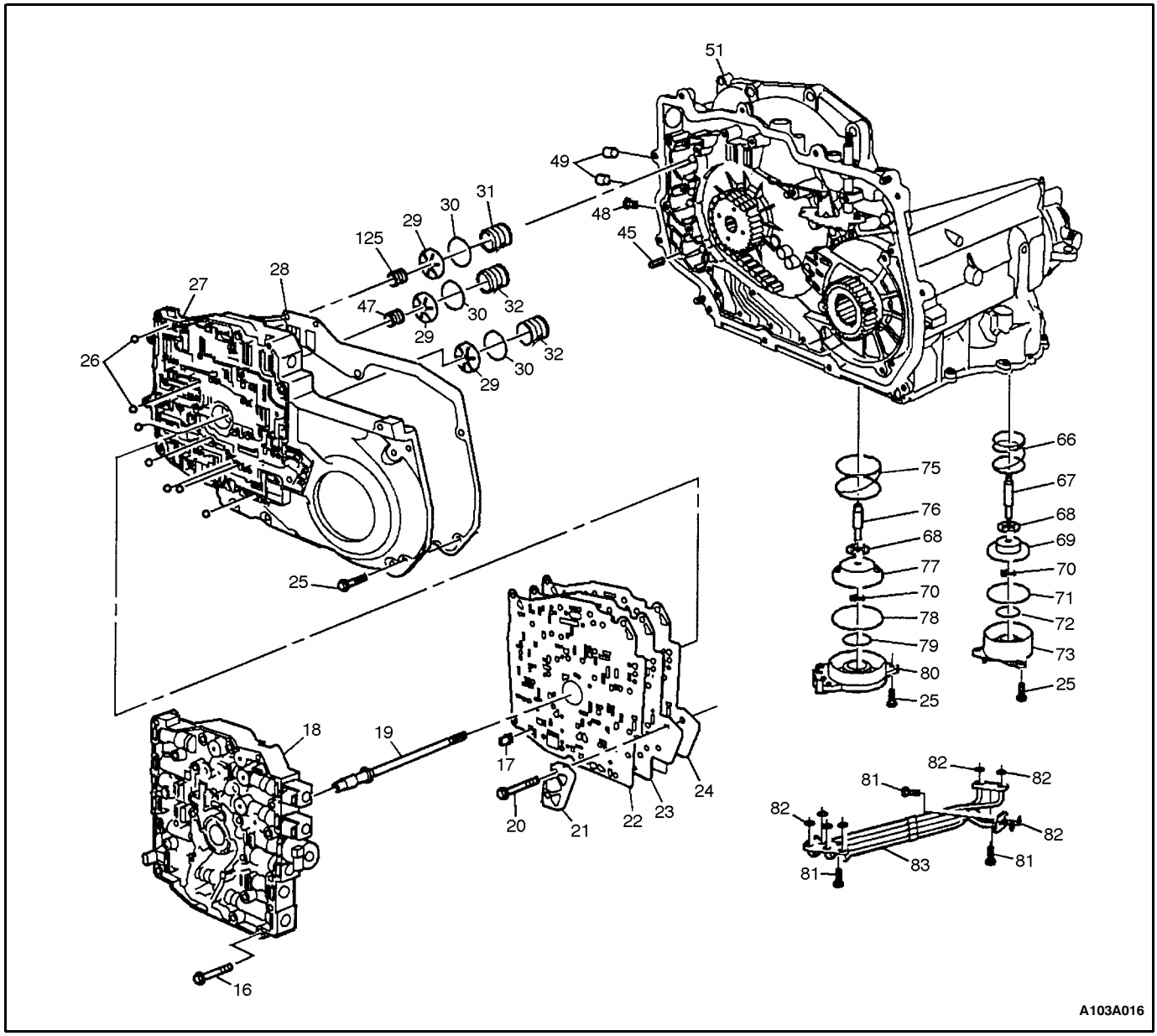
800 Manual Valve
801 Manual Valve-to-Link Clip
802 Manual Valve-to-Detent Lever Link
803 Manual Shaft-to-Case Pin
804 Manual Detent Spring and Roller Assembly
805 Spring and Roller Assembly-to-Channel Plate Bolt
806 Manual Shaft and Detent Lever Assembly
807 Parking Lock Actuator Assembly
809 Manual Shaft-to-Case Seal
810 Spring (Actuator Guide) Pin
811 Actuator Guide Seal
812 Actuator Guide

CASE AND ASSOCIATED PARTS (1 OF 3)



1 Side Cover (Structural)
2 Axle Oil Seal
3 Side Cover Bolt
4 Side Cover Stud
5 Side Cover Gasket
6 Side Cover Oil Level Control Gasket
7 Thrust (Side Cover-to-Driven Sprocket) Washer
8 Oil Pump Bolt
9 Oil Pump Bolt
10 Transmission Oil Pump Assembly
11 Transmission Wiring Harness
12 Transmission Fluid Pressure Switch Bolt
13 Transmission Fluid Pressure (TFP) Switch
15 Wiring Harness Bracket Bolt/Input Speed Sensor Bolt
51 Transmission Case
52 Vent Cap
55 Torque Converter Assembly
61 Output Speed Sensor Stud
62 Output Speed Sensor
63 O-Ring (Output Speed Sensor) Seal
64 Band Anchor-LO/Reverse Pin
65 Oil Level Control Plug
81 Tube Assembly Bolt/Bottom Pan Bolt
84 Transmission Oil Filter Seal
85 Transmission Oil Filter Assembly
86 Oil Level Control Valve
87 Transmission Bottom Pan Gasket
88 Transmission Oil Pan
89 Chip Collector Magnet

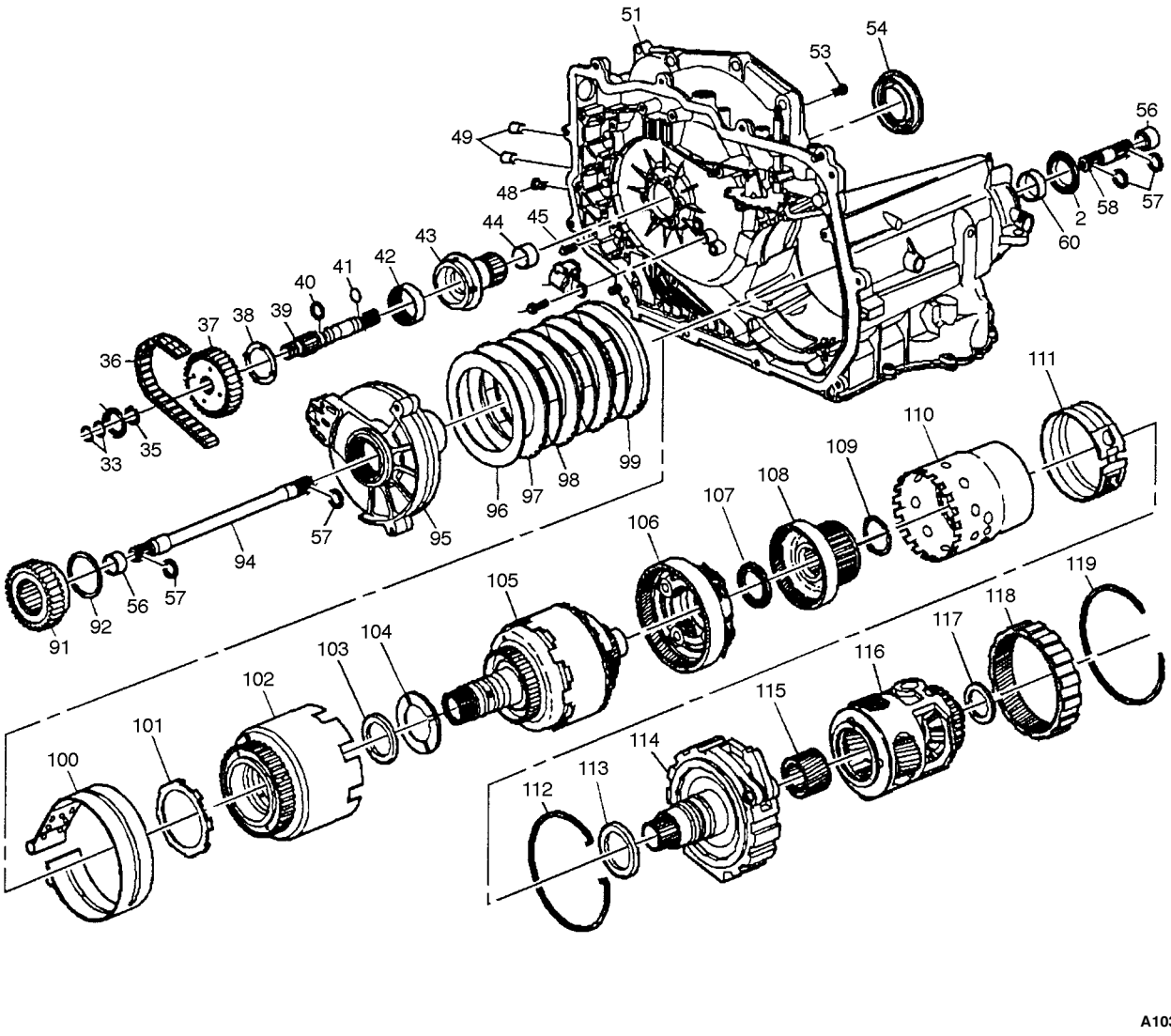
CASE AND ASSOCIATED PARTS (2 OF 3)



16 Valve Body Bolt
17 Filter
18 Control Valve Body Assembly
19 Oil Pump Drive Shaft
20 Spacer Plate Support Bolt
21 Spacer Plate Support
22 Valve Body-to-Spacer Plate Gasket
23 Valve Body Spacer Plate
24 Spacer Plate-to-Channel Plate Gasket
25A Channel Plate Bolt/Servo Cover Bolt
25B Channel Plate Bolt/Servo Cover Bolt
25C Channel Plate Bolt/Servo Cover Bolt
26 Checkballs
27 Channel Plate
28 Case-to-Channel Plate Gasket
29A Accumulator Piston (1-2, 2-3, and 3-4)
29B Accumulator Piston (1-2, 2-3, and 3-4)
29C Accumulator Piston (1-2, 2-3, and 3-4)
30A Accumulator Piston Seal (1-2, 2-3 and 3-4)
30B Accumulator Piston Seal (1-2, 2-3 and 3-4)
30C Accumulator Piston Seal (1-2, 2-3 and 3-4)
31 1-2 Accumulator Piston Spring
32A 2-3 and 3-4 Accumulator Piston Spring
32B 2-3 and 3-4 Accumulator Piston Spring
45 Dowel (Channel Plate-to-Case) Pin
48 Line Pressure Tap Plug
49 Cooler Pipe Seal
51 Transmission Case
66 Servo Return (LO/Reverse) Spring
67 Servo Apply (LO/Reverse) Pin

68A Servo Cushion Spring
68B Servo Cushion Spring
69 Servo (LO/Reverse) Piston
70A Servo Snap Ring
70B Servo Snap Ring
71 Servo Piston (LO/Reverse) Seal
72 Servo Cover (LO/Reverse) Seal
73 Servo (LO/Reverse) Cover
75 Servo Return (Intermediate/4th) Spring
76 Servo Apply (Intermediate/4th) Pin
77 Servo (Intermediate/4th) Piston
78 Servo Piston (Intermediate/4th) Seal
79 Servo Cover (Intermediate/4th) Seal
80 Servo (Intermediate/4th) Cover
81A Tube Assembly Bolt/Bottom Pan Bolt
81B Tube Assembly Bolt/Bottom Pan Bolt
81C Tube Assembly Bolt/Bottom Pan Bolt
82A Oil Feed Tube Assembly Seal
82B Oil Feed Tube Assembly Seal
82C Oil Feed Tube Assembly Seal
82D Oil Feed Tube Assembly Seal
83 Oil Feed Tube Assembly

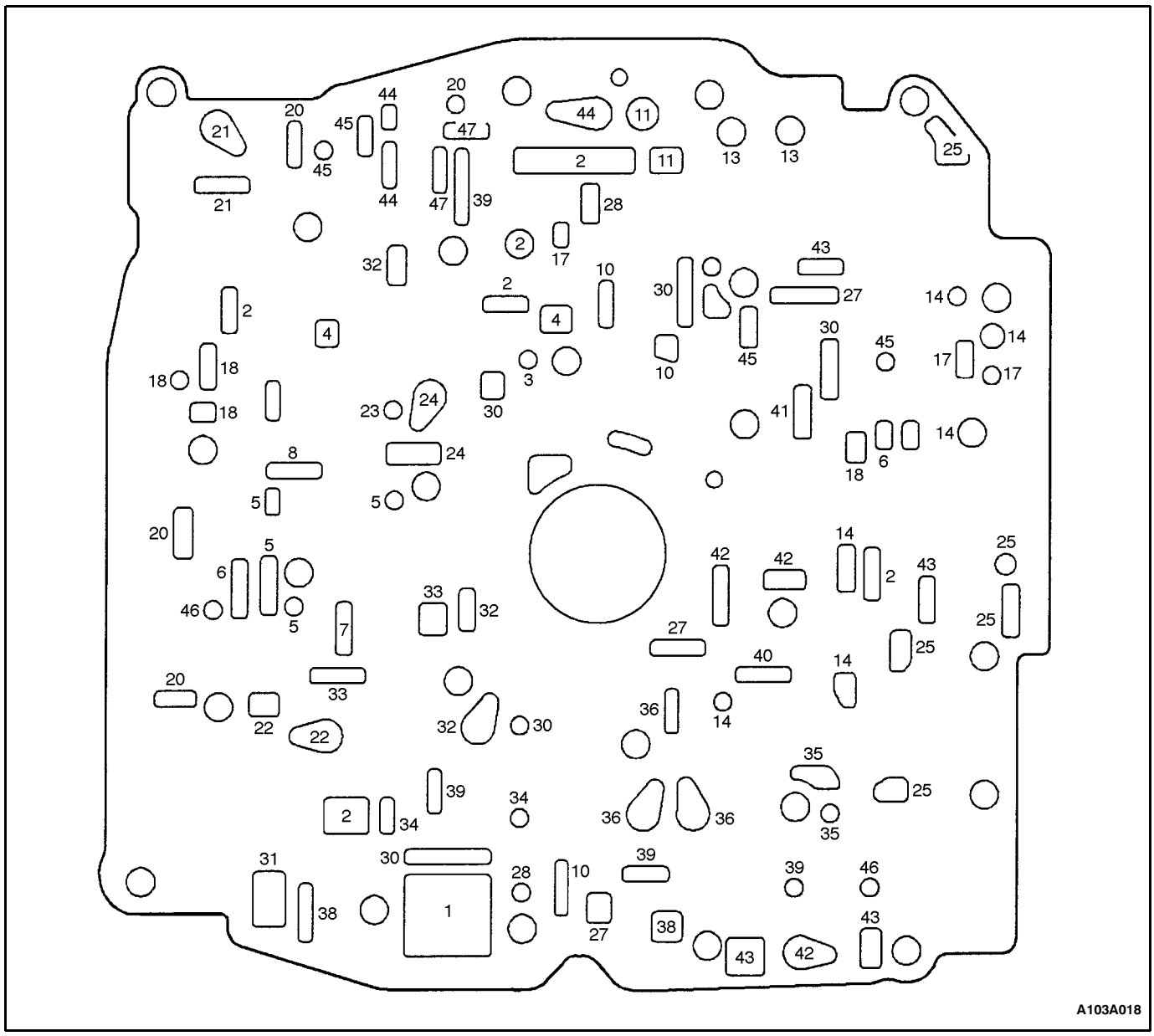
CASE AND ASSOCIATED PARTS (3 OF 3)



- 2 Axle Oil Seal
- 15 Wiring Harness Bracket Bolt/Input Speed Sensor Bolt
- 33 Turbine Shaft-to-Drive Sprocket Ring
- 35 Snap (Turbine Shaft-to-Drive Sprocket) Ring
- 36 Drive Link Assembly
- 37 Drive Sprocket
- 38 Thrust (Drive Sprocket-to-Support) Washer
- 39 Turbine Shaft
- 40 Turbine Shaft-to-Support Seal
- 41 O-ring Seal (Torque Converter)
- 42 Drive Sprocket Support Bearing
- 43 Drive Sprocket Support
- 44 Drive Sprocket Support Bushing
- 45 Dowel Pin (Channel Plate-to-Case)
- 46 Input Speed Sensor
- 48 Line Pressure Tap Plug
- 49 Cooler Pipe Seal
- 51 Transmission Case
- 52 Vent Cap
- 53 Drive Sprocket Support Screw
- 54 Converter Seal
- 56 Output/Stub Shaft Sleeve
- 57A Output/Stub Shaft Snap Ring
- 57B Output/Stub Shaft Snap Ring
- 57C Output/Stub Shaft Snap Ring
- 58 Output Stub Shaft
- 60 Case-to-Final Drive Bushing
- 91 Driven Sprocket
- 92 Thrust (Driven Sprocket-to-Support) Washer

94 Output Shaft
95 Driven Sprocket Support Assembly
96 2nd Clutch Waved Plate
97 2nd Clutch Steel Plate
98 2nd Clutch Fiber Plate
99 2nd Clutch Backing Plate
100 Intermediate/4th Band
101 Thrust (Support-to-Reverse Input Clutch) Washer
102 Reverse Input Clutch Assembly
103 Thrust Bearing
104 Thrust (Selective) Washer
105 Direct & Coast Clutch Assembly
106 Input Carrier Assembly
107 Thrust Bearing
108 Input Flange & Forward Clutch Hub Assembly
109 Thrust Washer
110 Forward Clutch Assembly
111 LO/Reverse Band
112 Snap Ring (Forward Clutch Support-to-Case)
113 Thrust Bearing
114 Forward Clutch Support Assembly
115 Sun Gear (Final Drive)
116 Differential and Final Drive Assembly
117 Thrust Bearing
118 Final Drive Internal Gear
119 Fretting Internal Gear-to-Case Ring

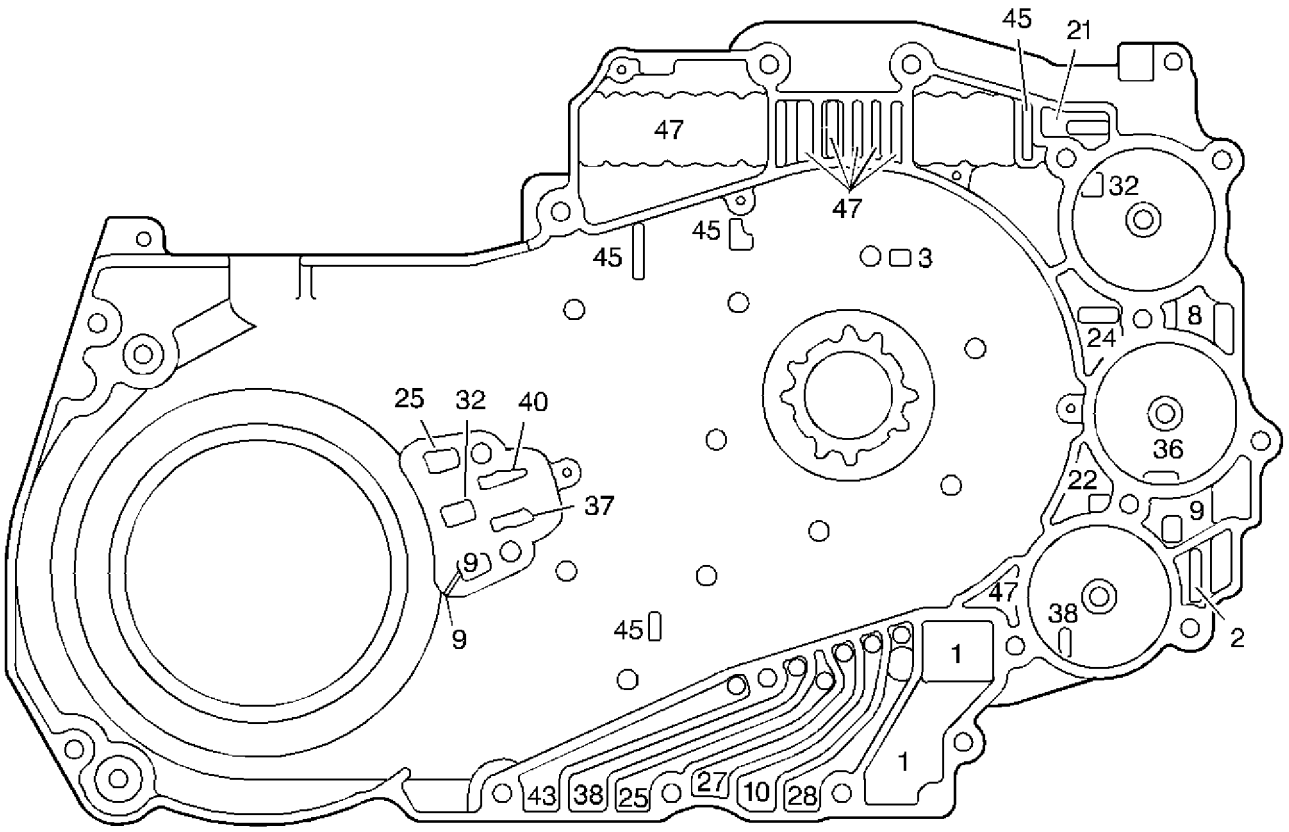
VALVE BODY-TO-SPACER PLATE GASKET



1 Suction
2 Line
3 Decrease
4 Converter Feed
5 TCC Feed Limit
6 Release
7 Apply
8 Cooler
10 Lube 2
11 PRN
13 PRND4
14 Actuator Feed
17 2-3 Signal
18 Torque Signal
20 1-2/3-4 Accumulator
21 1-2 Accumulator Feed
22 3-4 Accumulator Feed
23 2-3 Accumulator
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
30 2-3 Drive
31 Filtered 2-3 Drive
32 2nd Clutch
33 TCC Signal (PWM)
34 TCC-Regulated Apply
35 3-4 Drive
36 Direct Clutch Feed
38 4th Band

39 D321
40 Coast Clutch
41 D21
42 Intermediate Band Feed
43 Intermediate Band
44 LO
45 Exhaust
46 Orificed Exhaust
47 Void

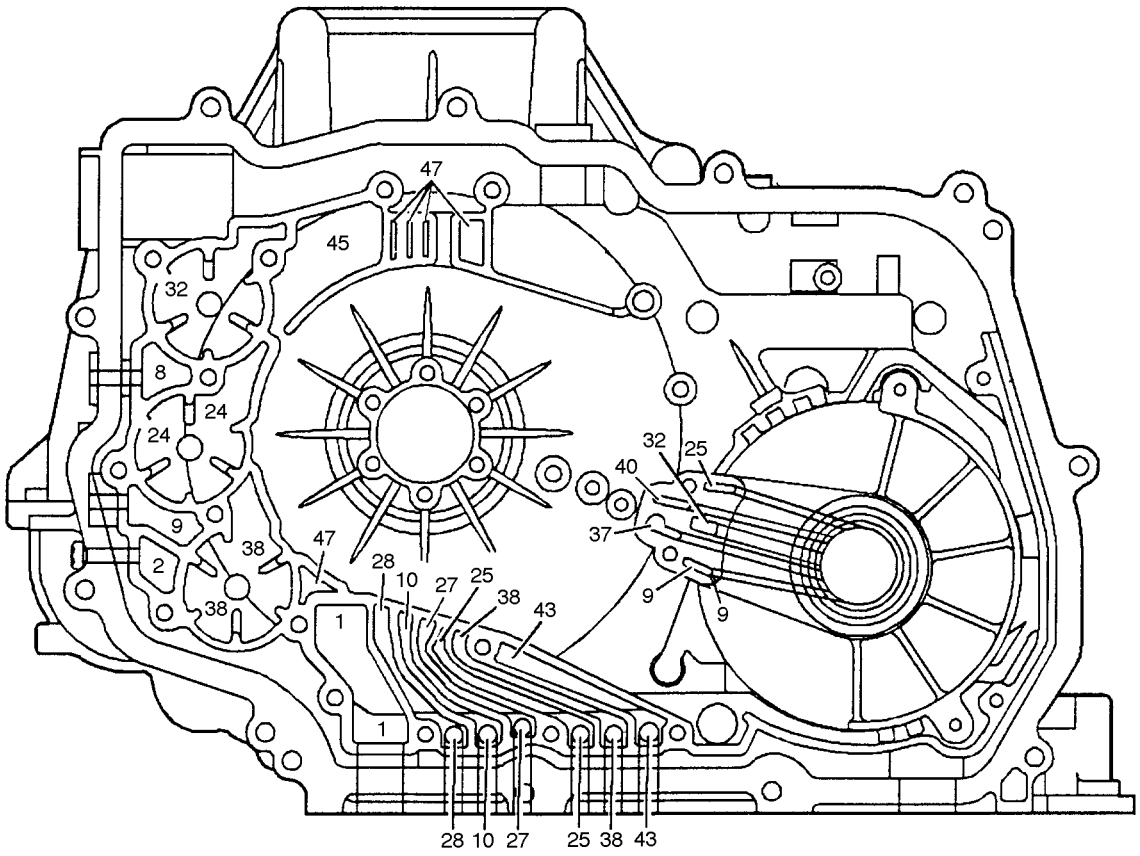
CHANNEL PLATE PASSAGES - CASE SIDE



A103A019

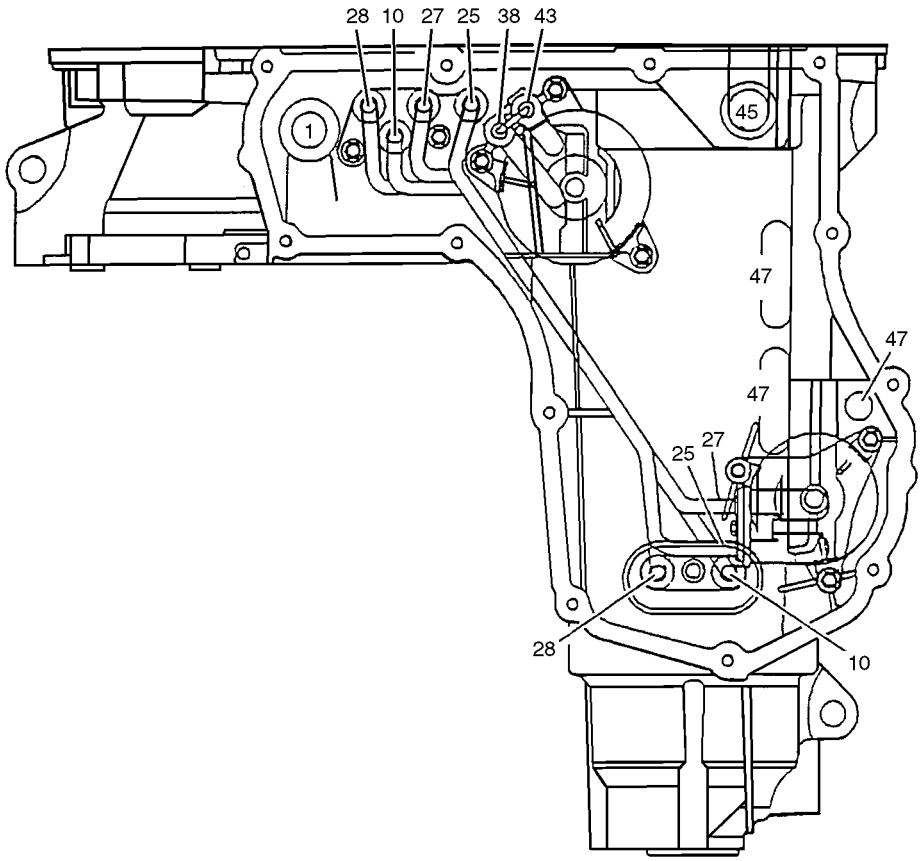
1 Suction
2 Line
3 Decrease
8 Cooler
9 Lube 1
10 Lube 2
21 1-2 Accumulator Feed
22 3-4 Accumulator Feed
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
32 2nd Clutch
36 Direct Clutch Feed
37 Direct Clutch
38 4th Band
40 Coast Clutch
43 Intermediate Band
45 Exhaust
47 Void

CASE PASSAGES - CHANNEL PLATE SIDE



1 Suction
2 Line
8 Cooler
9 Lube 1
10 Lube 2
24 Direct Clutch Feed
25 Reverse
27 LO Band
28 Drive
32 2nd Clutch
37 Direct Clutch
38 4th Band
40 Coast Clutch
43 Intermediate Band
45 Exhaust
47 Void

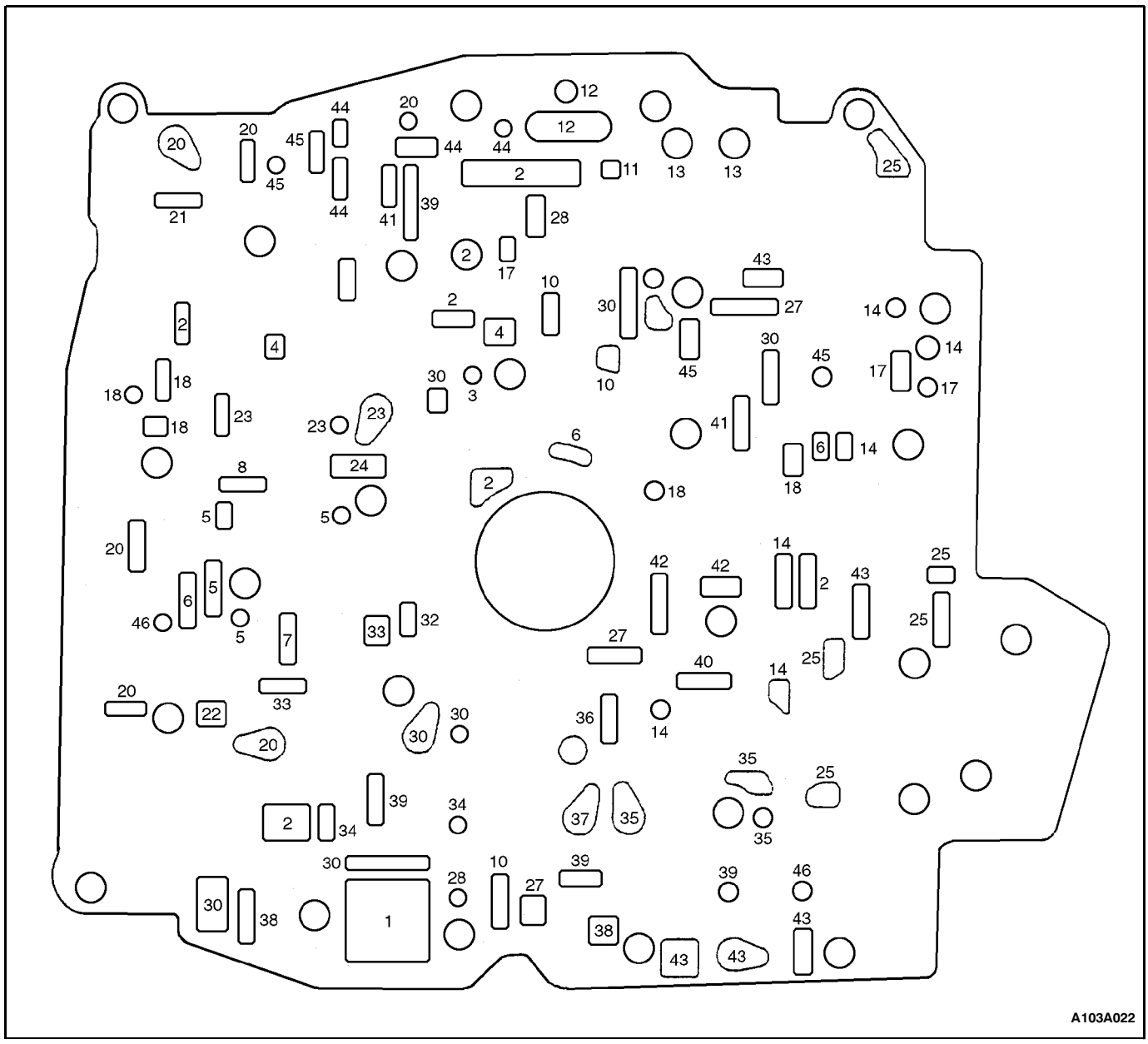
CASE PASSAGES - BOTTOM



A103A021

1 Suction	38 4th Band
10 Lube 2	43 Intermediate Band
25 Reverse	45 Exhaust
27 LO Band	47 Void
28 Drive	

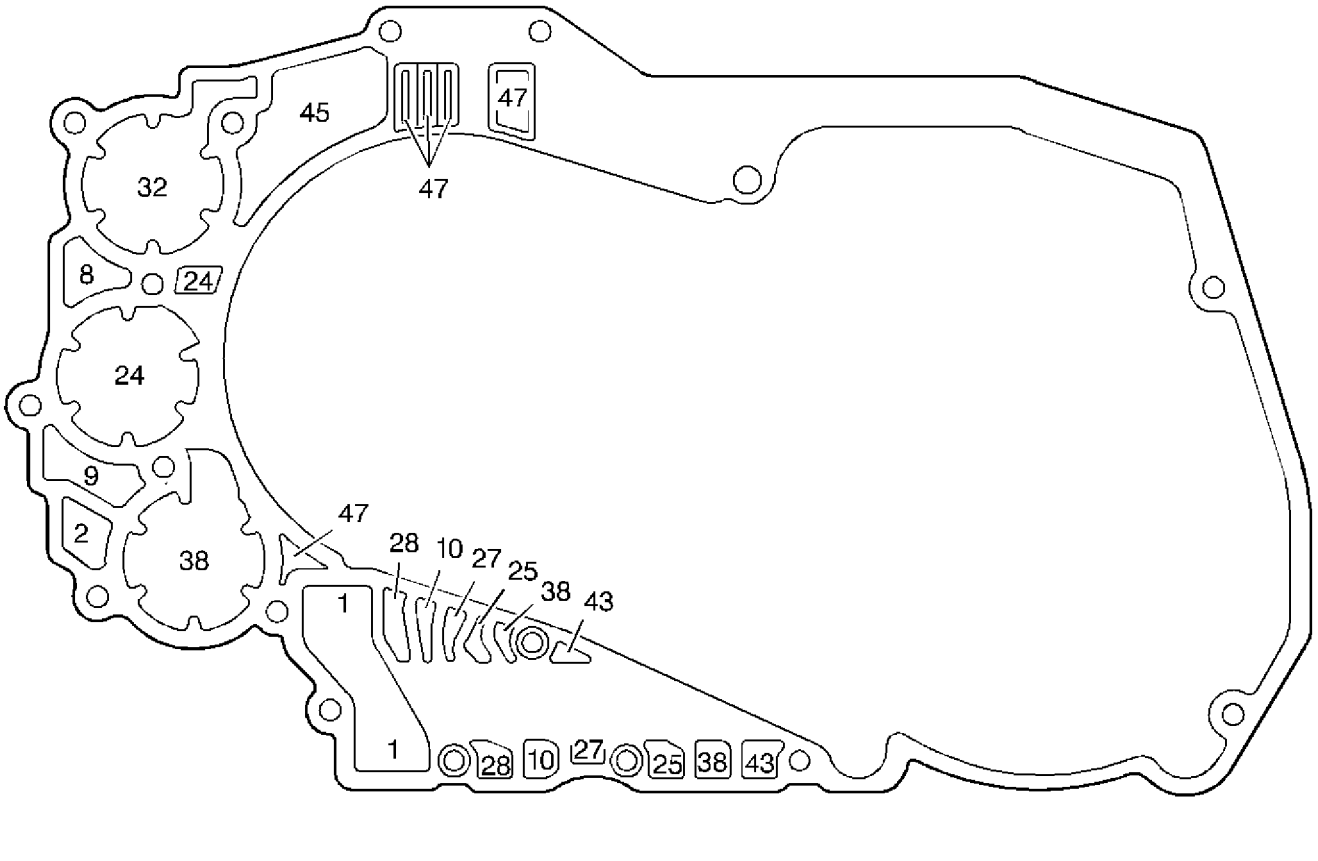
SPACER PLATE-TO-CHANNEL PLATE GASKET



1 Suction
2 Line
3 Decrease
4 Converter Feed
5 TCC Feed Limit
6 Release
7 Apply
8 Cooler
10 Lube 2
11 PRN
12 LO/PRN
13 PRND4
14 Actuator Feed
17 2-3 Signal
18 Torque Signal
20 1-2/3-4 Accumulator
21 1-2 Accumulator Feed
22 3-4 Accumulator Feed
23 2-3 Accumulator
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
30 2-3 Drive
32 2nd Clutch
33 TCC Signal (PWM)
34 TCC-Regulated Apply
35 3-4 Drive
36 Direct Clutch Feed
37 Direct Clutch

38 4th Band
39 D321
40 Coast Clutch
41 D21
42 Intermediate Band Free
43 Intermediate Band
44 LO
45 Exhaust
46 Orificed Exhaust

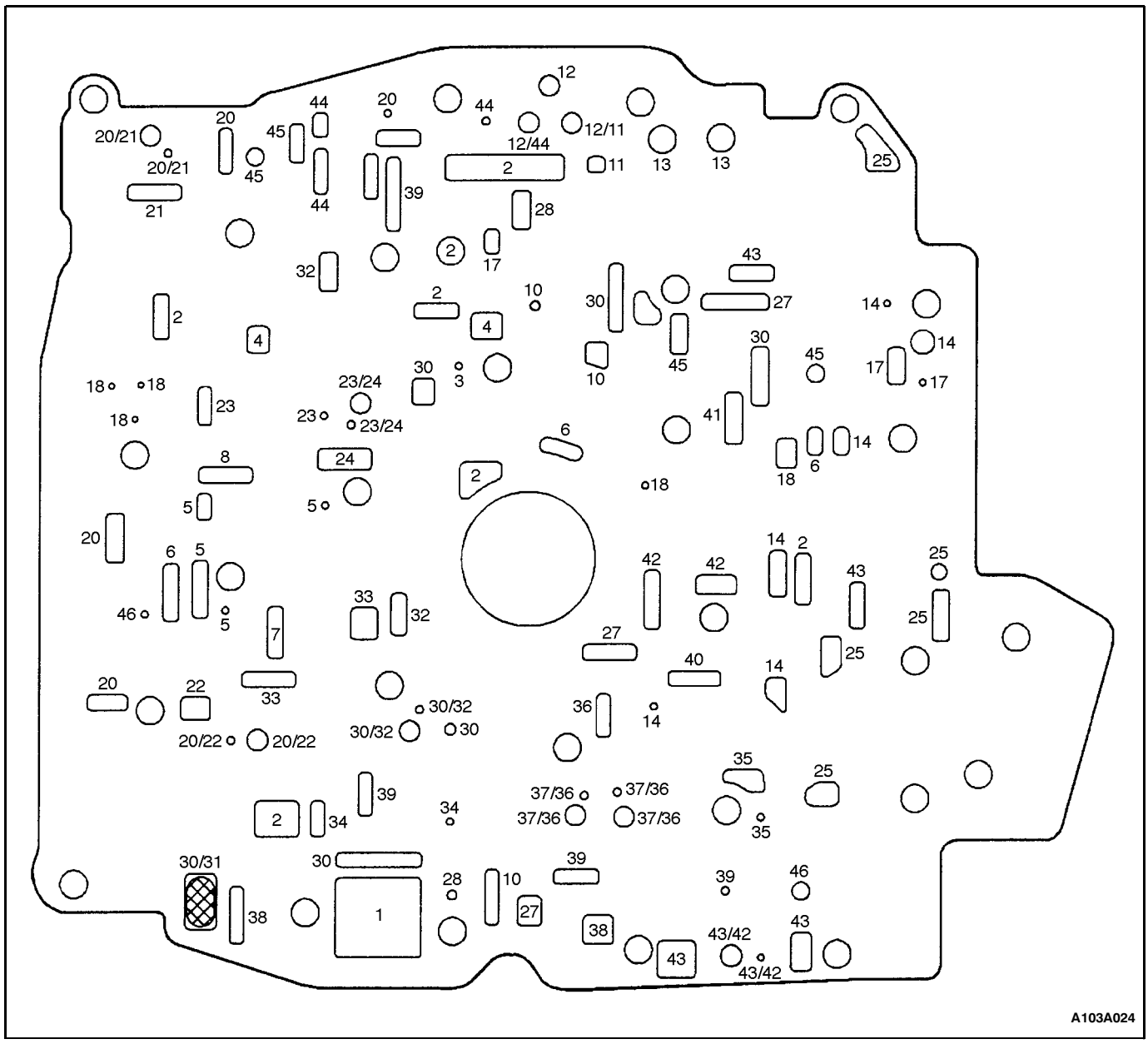
CHANNEL PLATE-TO-CASE GASKET



A103A023

1 Suction
2 Line
8 Cooler
9 Lube 1
10 Lube 2
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
32 2nd Clutch
38 4th Band
43 Intermediate Band
45 Exhaust
47 Void

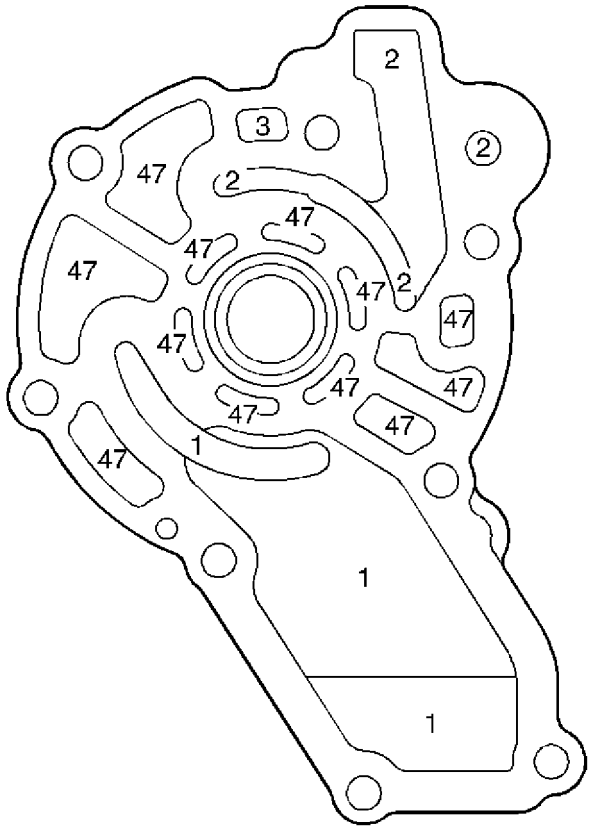
SPACER PLATE



1 Suction
2 Line
3 Decrease
4 Converter Feed
5 TCC Feed Limit
6 Release
7 Apply
8 Cooler
10 Lube 2
11 PRN
12 LO/PRN
13 PRND4
14 Actuator Feed
17 2-3 Signal
18 Torque Signal
20 1-2/3-4 Accumulator
21 1-2 Accumulator Feed
22 3-4 Accumulator Feed
23 2-3 Accumulator
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
30 2-3 Drive
31 Filtered 2-3 Drive
32 2nd Clutch
33 TCC Signal (PWM)
34 TCC-Regulated Apply
35 3-4 Drive
36 Direct Clutch Feed

37 Direct Clutch
38 4th Band
39 D321
40 Coast Clutch
42 Intermediate Band Feed
43 Intermediate Band
44 LO
45 Exhaust
46 Orificed Exhaust

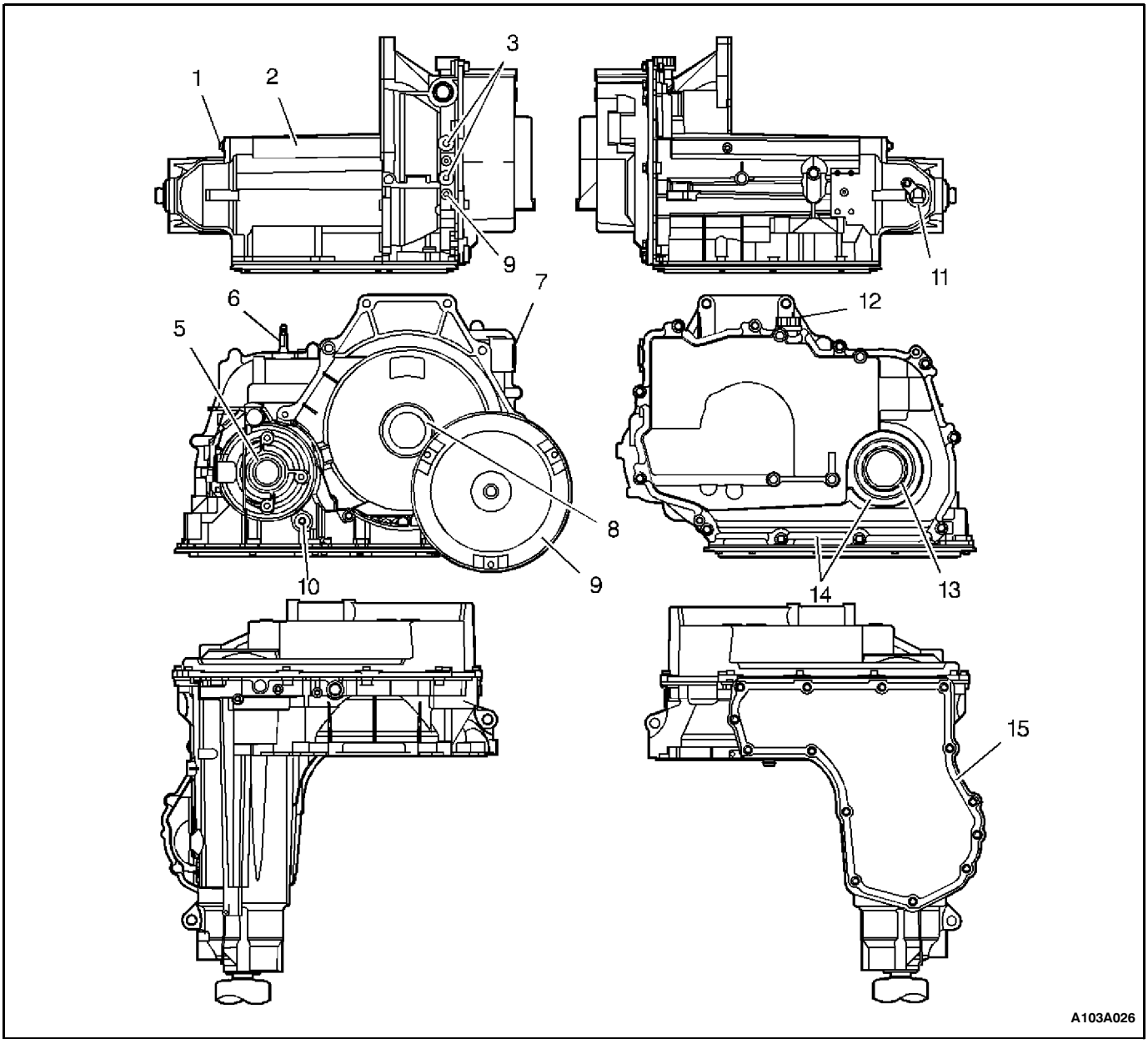
PUMP BODY OIL CHANNELS



A103A025

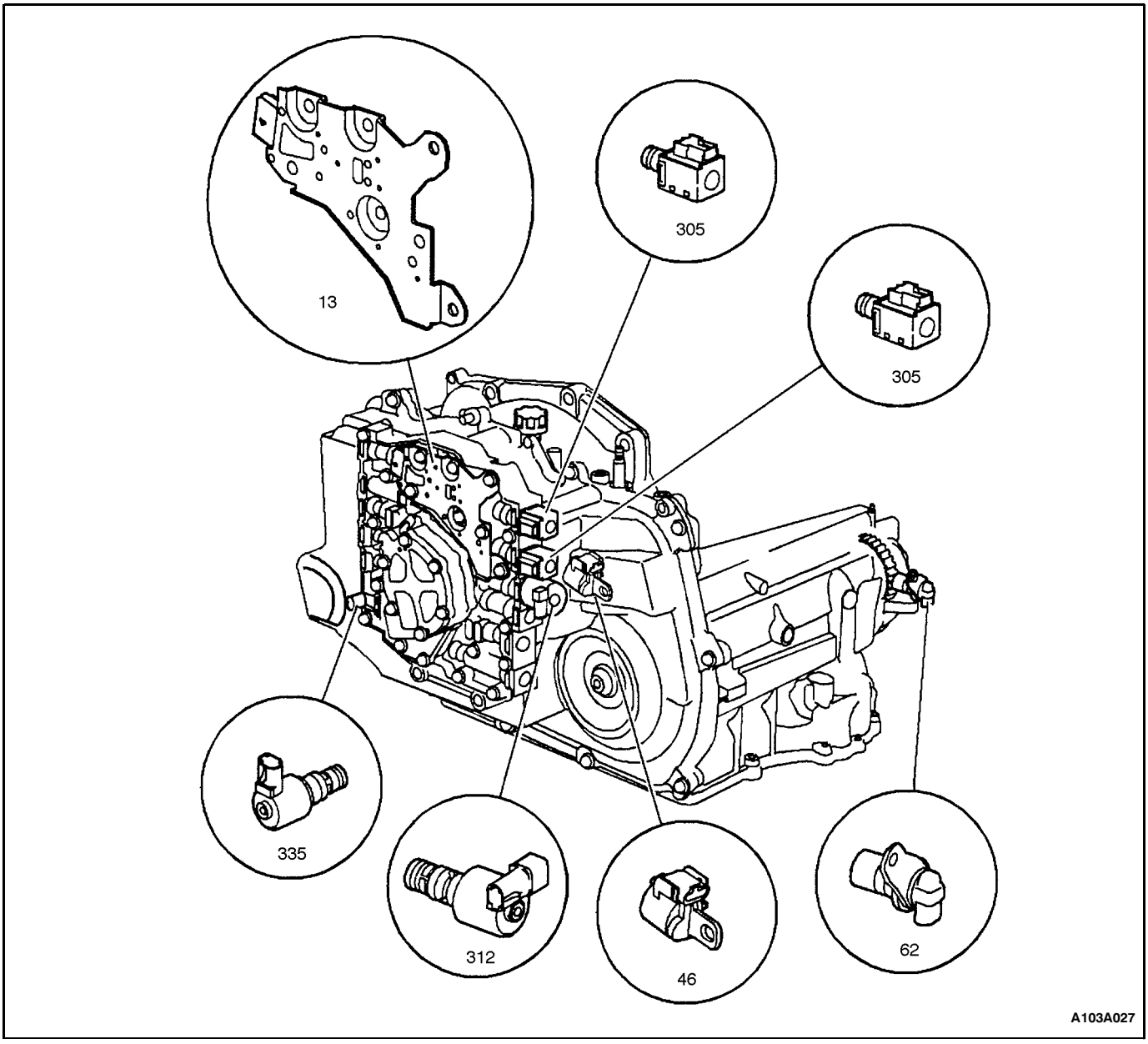
1 Suction
2 Line
3 Decrease
47 Void

4T40-E LEAK INSPECTION POINTS



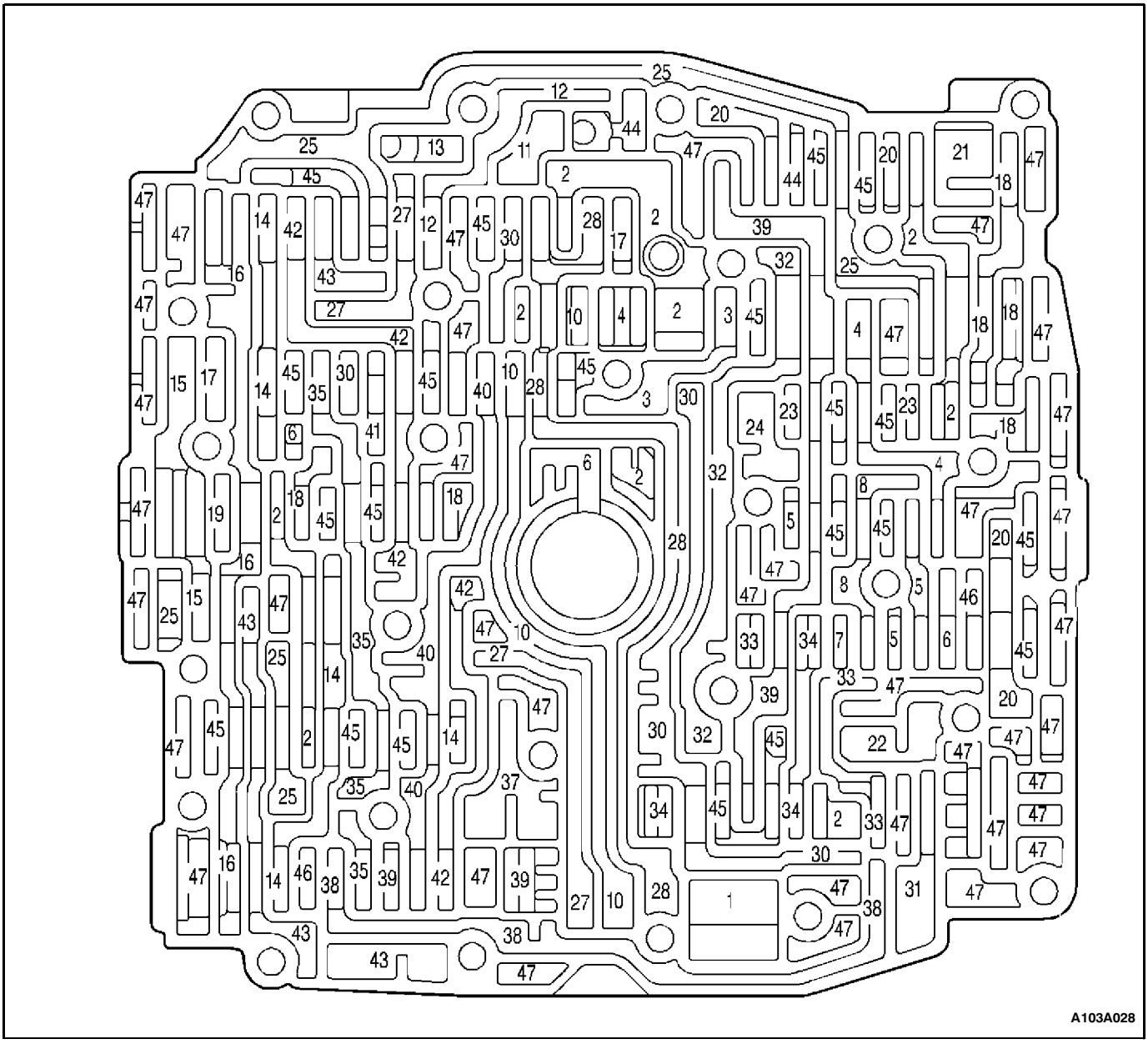
1 Actuator Guide Seal
2 Case
3 Cooler Line Seals
4 Line Pressure Plug
5 Axle Seal (Case) and Stub Shaft Sleeve
6 Manual Shaft Seal
7 Pass-Thru Connector Seal
8 Converter Seal
9 Torque Converter
10 Fluid Level Plug
11 Output Speed Sensor Seal
12 Fill Cap Seal and Vent
13 Axle Seal (Side Cover) and Output Shaft Sleeve
14 Side Cover Seals
15 Bottom Pan Gasket

ELECTRONIC COMPONENT LOCATION VIEWS



13 Pressure Switch Assembly
305 1-2/2-3 Shift Solenoid
62 A/T Output Speed Sensor
46 A/T Input Speed Sensor
312 Pressure Control Solenoid
335 TCC Control PWM Solenoid

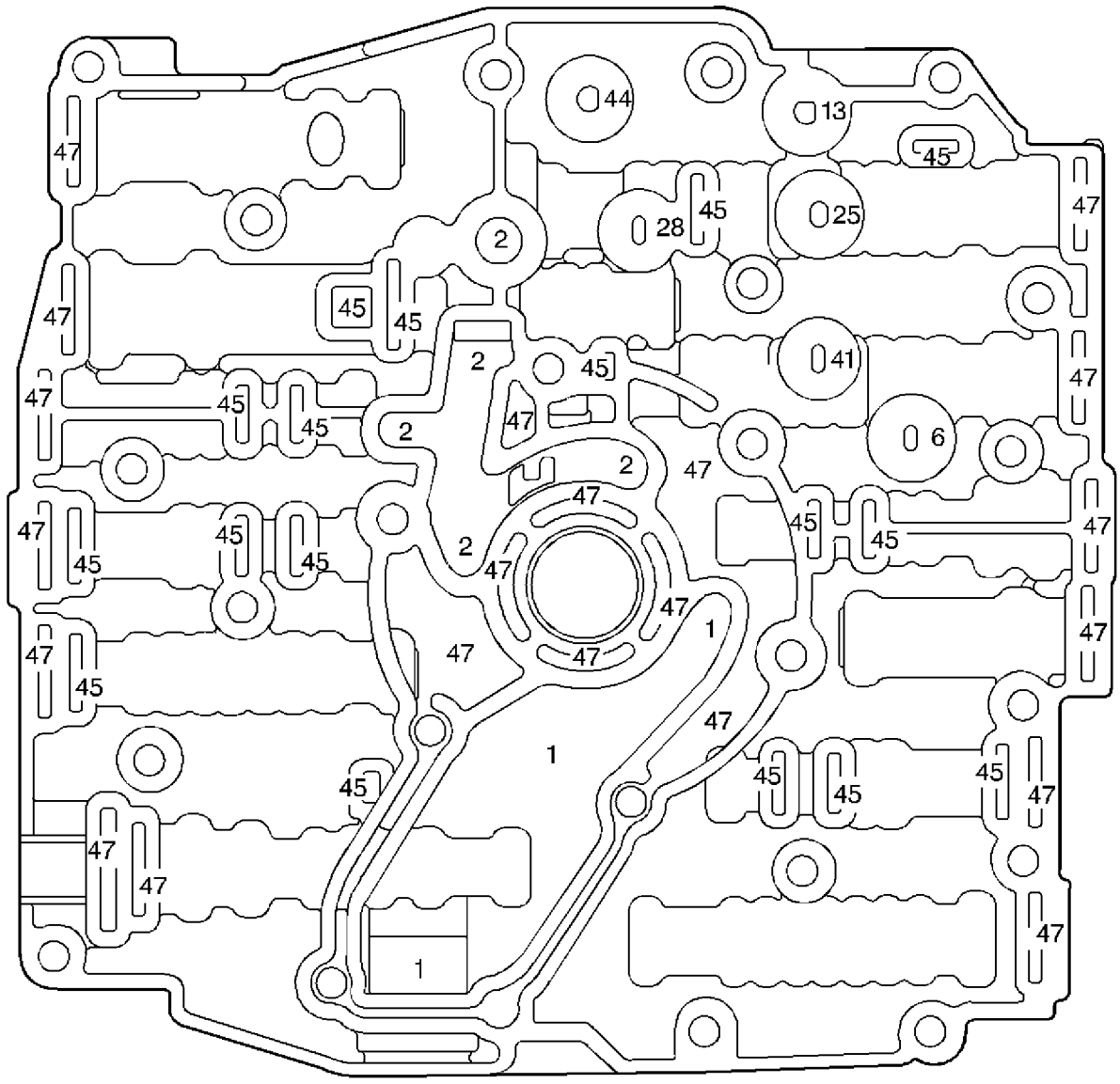
CONTROL VALVE BODY CHANNELS - CHANNEL PLATE SIDE



1 Suction
2 Line
3 Decrease
4 Converter Feed
5 TCC Feed Limit
6 Release
7 Apply
8 Cooler
10 Lube 2
11 PRN
12 LO/PRN
13 PRND4
14 Actuator Feed
15 Filtered Actuator Feed
16 1-2 Signal
17 2-3 Signal
18 Torque Signal
19 PCS Signal
20 1-2/3-4 Accumulator
21 1-2 Accumulator Feed
22 3-4 Accumulator
23 2-3 Accumulator
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
30 2-3 Drive
32 2nd Clutch
33 TCC Signal (PCM)
34 TCC-Regulated Apply
35 3-4 Drive
37 Direct Clutch

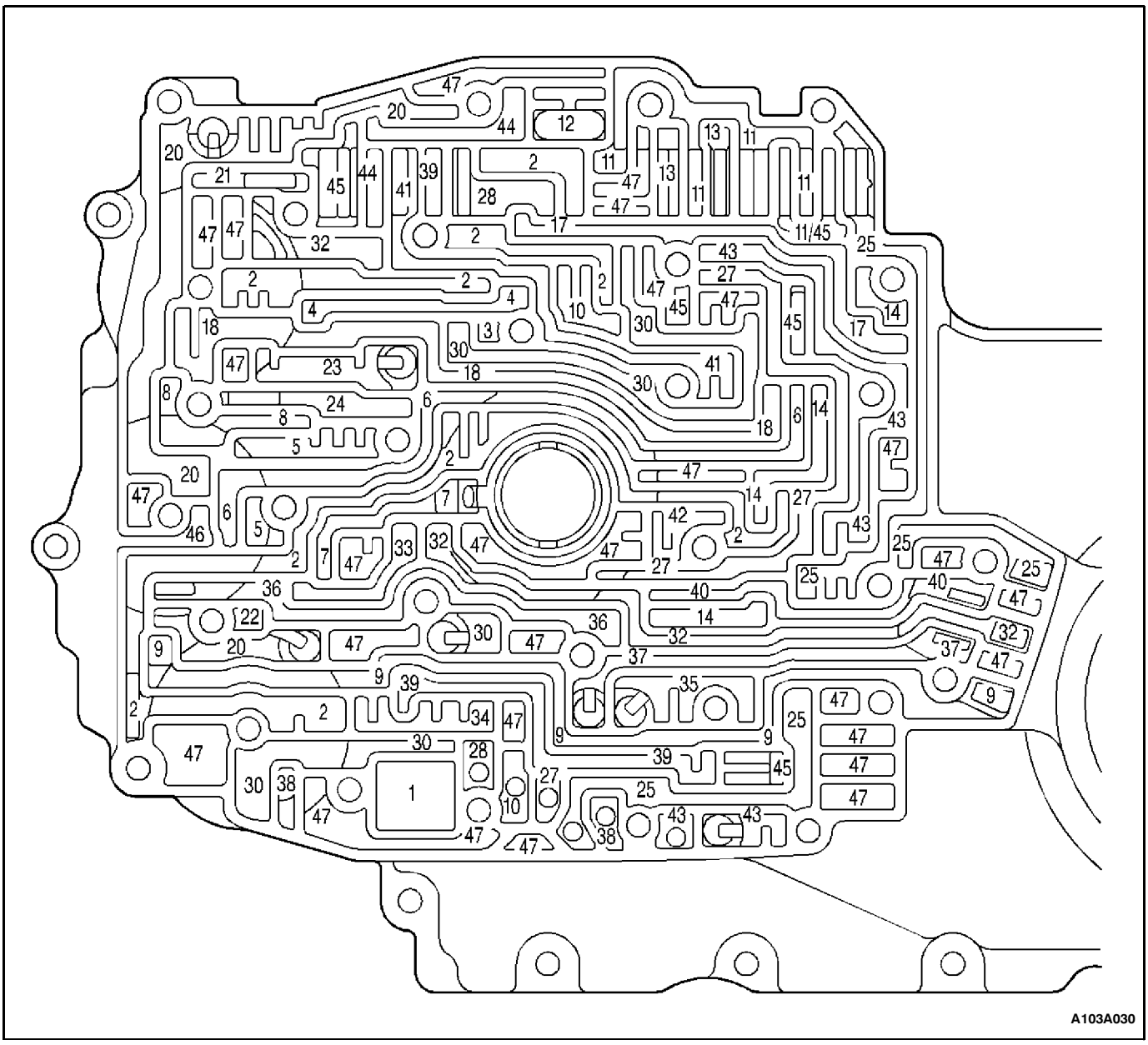
38 4th Band
39 D321
40 Coast Clutch
41 D21
42 Intermediate Band Feed
43 Intermediate Band
44 LO
45 Exhaust
46 Orificed Exhaust
47 Void

CONTROL VALVE BODY CHANNELS - OIL PUMP SIDE



1 Suction
2 Line
6 Release
13 PRND4
25 Reverse
28 Drive
41 D21
44 LO
45 Exhaust
47 Void

CHANNEL PLATE PASSAGES - CONTROL VALVE BODY SIDE



1 Suction
2 Line
3 Decrease
4 Converter Feed
5 TCC Feed Limit
6 Release
7 Apply
8 Cooler
9 Lube 1
10 Lube 2
11 PRN
12 LO/PRN
13 PRND4
14 Actuator Feed
17 2-3 Signal
18 Torque Signal
20 1-2/3-4 Accumulator
21 1-2 Accumulator Feed
22 3-4 Accumulator
23 2-3 Accumulator
24 2-3 Accumulator Feed
25 Reverse
27 LO Band
28 Drive
30 2-3 Drive
32 2nd Clutch
33 TCC Signal (PWM)
34 TCC-Regulated Apply
35 3-4 Drive
36 Direct Clutch Feed
37 Direct Clutch

DIAGNOSIS

BASIC KNOWLEDGE REQUIRED

You must be familiar with some basic electronics to use this section of the Service Manual. They will help you to follow diagnostic procedures.

Notice: Lack of basic knowledge of this powertrain when performing diagnostic procedures could result in incorrect diagnostic performance or damage to powertrain components. Do not, under any circumstances, attempt to diagnose a transmission problem without this basic knowledge.

Notice: If a wire is probed with a sharp instrument and not properly sealed afterward, the wire will corrode and an open circuit will result.

Diagnostic test probes are now available that allow you to probe individual wires without leaving the wire open to the environment. These probe devices are inexpensive and easy to install, and they permanently seal the wire from corrosion.

Special Tools

You should be able to use a Digital Volt Meter (DVM), a circuit tester, jumper wires or leads and a line pressure gauge set. The functional test procedure is designed to verify the correct operation of electronic components in the transaxle. This will eliminate the unnecessary removal of transaxle components.

FUNCTIONAL CHECK PROCEDURE

Begin with the Functional Check Procedure which provides a general outline of how to diagnose HYDRA-MATIC 4T40-E. The Functional Check Procedure will indicate the proper path of diagnosing the transaxle by describing the basic checks and then referencing the locations of the specific checks.

Use on-board diagnostics or TECH 1 (or other scan tool) to see if any transaxle trouble codes have been set. Refer to the appropriate "Diagnostic Trouble Code" information and repair the vehicle as directed. After repairing the vehicle, perform the road test and verify that the code has not set again.

If no trouble codes have been set and the condition is suspected to be hydraulic, take the vehicle on a road test. Refer to "Road Test Procedure" in this section.

4T40-E TRANSAXLE FUNCTIONAL CHECK PROCEDURE

Step	Action	Value(s)	Yes	No
1	Perform the Fluid Level Service Procedure. Is the fluid level correct?	-	Go to Step 2	-
2	Check for TCM trouble codes, both current and history. Are TCM trouble codes present?	-	Go to Tech 1 Data Value Examples	Go to Step 3
3	1. Perform the Electrical/Garage Shift Tests. 2. Perform the Road Test Procedure. Was the condition duplicated?	-	Go to Step 4	Go to Step 12
4	Is a harsh or soft shift condition present?	-	Go to Step 7	Go to Step 5
5	Is the vehicle's performance poor?	-	Go to Torque Converter Evaluation section of "Torque Converter Clutch Diagnosis"	Go to Step 6
6	Is the engagement into Drive or Reverse delayed or missing?	-	Go to Step 7	Go to Step 9
7	Perform the Line Pressure Check Procedure. Is the line pressure correct?	-	Go to Step 8	Refer to Symptom Diagnosis Charts

4T40-E Transaxle Functional Check Procedure (Cont'd)

Step	Action	Value(s)	Yes	No
8	Inspect the transmission wire harness connectors and the transmission range switch. Was the problem found and corrected?	-	System OK	Refer to Symptom Diagnosis Charts
9	Is vibration or noise a problem?	-	Refer to Vibration Test Procedure of "Torque Converter Clutch Diagnosis"	Go to Step 10
10	Is the fluid leaking?	-	Refer to Leak Diagnosis and Repair	Go to Step 11
11	Are other transmission conditions present?	-	Refer to Symptom Diagnosis Chart	Go to Step 12
12	The condition is intermittent. Re-examine the complaint.	-	Exit Table	-

LINE PRESSURE CHECK PROCEDURE

The HYDRA-MATIC 4T40-E uses a vane type oil pump to produce hydraulic pressure, and a transaxle pressure control solenoid to control that pressure at the pressure regulator valve, after it leaves the pump. The transaxle pressure control solenoid is controlled by an electrical signal that ranges from 0 to 1.1 amp 1.1 amp corresponds to minimum line pressure (approx. 310 to 380 kPa: 45-55 psi not 0 psi) and 0 amps corresponds to a maximum line pressure (approx. 965 to 1240 kPa: 140 to 180 psi) in Overdrive (D).

Line pressures are calibrated for two sets of gear ranges - Drive-Park-Neutral and Reverse. This allows the transaxle line pressure to be appropriate for different pressure needs in different gear ranges:

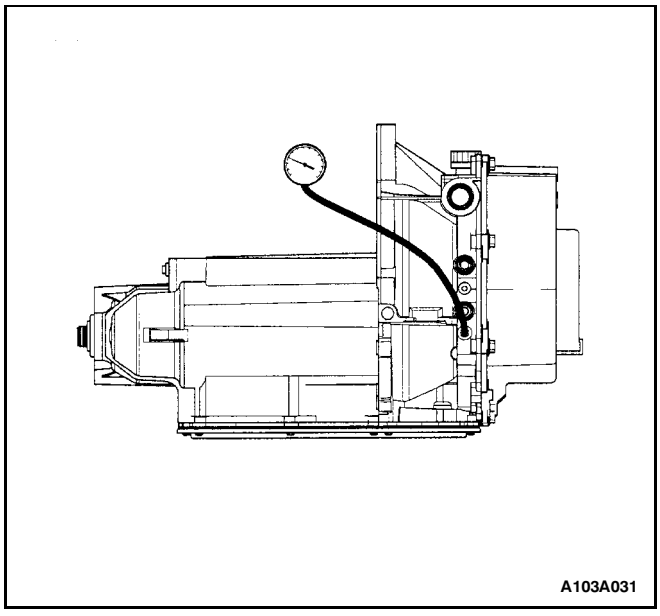
Gear Range	Nominal Line Pressure Range
Drive, Park or Neutral	50-160 psi (345-1103 kPa)
Reverse	58-186 psi (400-1282 kPa)

Before performing a line pressure check, verify that the pressure control solenoid is receiving the correct electrical signal from the TCM:

1. Install a scan tool.
2. Start the engine and set parking brake.
3. Check for a stored pressure control solenoid diagnostic trouble code, and other diagnostic trouble codes.
4. Repair vehicle if necessary.

   Inspect
   - Fluid level
   - Manual linkage

   Install or Connect
   - TECH 1 (Scan tool)
   - Oil pressure gage at line pressure tap



5. Put gear selector in Park and set the parking brake.
6. Start engine and allow it to warm up at idle.

7. Access the "PCS Control" test on the TECH 1 (scan tool).
8. Increase DESIRED PCS in 0.1 Amp increments and read the corresponding line pressure on the pressure gage. (Allow pressure to stabilize for 5 seconds after each current change.)
9. Compare data to the Drive-Park-Neutral line pressure chart below.

Notice: Total test running time should not exceed 2 minutes, or transaxle damage could occur.

Caution: Brakes must be applied at all times to prevent unexpected vehicle motion.

If pressure readings differ greatly from the line pressure chart, refer to the Diagnosis Charts contained in this section.

The TECH 1 scan tool is only able to control the pressure control solenoid in Park and Neutral with the vehicle stopped. This protects the clutches from extremely high or low pressures in Drive or Reverse ranges.

Pressure Control Solenoid Current (Amp)	Approximate Line Pressure (psi)
0.00	152-160
0.10	149-151
0.30	141-143
0.50	124-127
0.60	111-115
0.70	97-101
0.80	81-84
0.90	64-67
0.95	56-58
1.00	50-51
1.05	50
1.10	50

NOTE: Pressures are at 705C and vary with temperature. Pressure drops as temperature increases.

COMPONENT RESISTANCE CHECK PROCEDURE

Component	Pass Through Pins	Resistance 20°C (68°F)	Resistance 100°C (212°F)	Resistance to Ground (Case)
1-2 Shift Solenoid Valve	A, E	19-24W	24-31W	Greater than 250KW
2-3 Shift Solenoid Valve	B, E	19-24W	24-31W	Greater than 250KW
Torque Converter Clutch Pulse Width Modulation Solenoid Valve	T, E	10-11W	13-15W	Greater than 250KW
Pressure Control Solenoid Valve	C, D	3-5W	4-7W	Greater than 250KW
Transmission Fluid Pressure Switch	Refer to Pressure Switch Assembly Resistance Check			
*Transmission Fluid Temperature (TFT) Sensor	L, M	3106-3923W	164-190W	Greater than 20MW
Automatic Transmission Input (Shaft) Speed Sensor	S, V	615-700W	750-835W	Greater than 10MW
Automatic Transmission Output Speed Sensor	A, B	1530-1650W	1700-1870W	Greater than 10MW
Important: The resistance of this device is necessarily dependent on the temperature. Therefore the resistance will vary far more than any other device.				

PRESSURE SWITCH ASSEMBLY RESISTANCE CHECK

Step	Action	Value(s)	Yes	No
1	1. Install J 39775 Jumper Harness on the transmission 20-way connector, if needed. 2. Using J 39200 DVOM and J 35616 Connector Test Adapter Kit, measure the resistance from terminal U and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 3	Go to Step 2
2	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal D and the TFP Val. Position Sw. housing. Is the resistance less than the value shown?	50W	Go to Step 15	Go to Step 17
3	Measure the resistance from terminal N and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 5	Go to Step 4
4	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal A and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
5	Measure the resistance from terminal R and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 7	Go to Step 6
6	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal B and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
7	Measure the resistance from terminal P and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 9	Go to Step 8
8	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal C and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
9	1. Start the engine and let the engine idle. 2. Set the parking brake. 3. Place the gear selector in P (Park). 4. Measure the resistance from terminal U and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 10	Go to Step 17
10	1. Place the gear selector in R (Reverse). 2. Measure the resistance from terminal P and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 11	Go to Step 17
11	1. Place the gear selector in D4 (Drive). 2. Measure the resistance from terminal N and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 12	Go to Step 17

Pressure Switch Assembly Resistance Check (Cont'd)

Step	Action	Value(s)	Yes	No
12	Measure the resistance from terminal R and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 13	Go to Step 17
13	1. Place the gear selector in D1 (Low). 2. Measure the resistance from terminal N and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 14	Go to Step 17
14	Measure the resistance from terminal P and the transmission case. Is the resistance less than the value shown?	50W	No problem found; exit table	Go to Step 17
15	Inspect for high resistance: • Inspect the transmission wiring for poor electrical connections at the transmission 20-way connector and at the TFP Val. Position Sw. connector. • Look for possible bent, backed out, deformed, or damaged terminals. • Check for weak terminal tension. Was the condition found?	-	Verify repair and Go to Step 1	Go to Step 16
16	Replace the internal wiring harness. Is the replacement complete?	-	Verify repair and Go to Step 1	-
17	Replace the TFP Val. Position Sw. Is the replacement complete?	-	Verify repair and Go to Step 1	-

CLUTCH PLATE DIAGNOSIS

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Important: If the clutch shows evidence or extreme heat or burning, replace the springs.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch plates.
- Engine coolant in the transmission fluid.
- A cracked clutch piston.
- Damaged or missing seals.
- Low line pressure.
- Valve problems.
  - The valve body face is not flat
  - Porosity between channels
  - The valve bushing clips are improperly installed
  - The check balls are misplaced
- The Teflon® seal rings are worn or damaged.

ENGINE COOLANT IN TRANSAXLE

Notice: Antifreeze will deteriorate the Viton O-ring seals and the glue used to bond the clutch material to the pressure plate. Both conditions may cause transaxle damage.

Perform the following steps if the transmission oil cooler has developed a leak, allowing engine coolant to enter the transmission:

1. Because the coolant will attach the seal material causing leakage, disassemble the transmission and replace all rubber type seals.
2. Because the facing material may become separated from the steel center portion, replace the composition-faced clutch plate assemblies.
3. Replace all nylon parts including washers.
4. Replace the torque converter.
5. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
6. Flush the cooler lines after you have properly repaired or replaced the transmission cooler.

COOLER FLUSHING AND FLOW TEST

Notice: You must flush the cooler whenever you remove a transmission for service. Cooler flushing is essential for SRTA installation, major overhaul, whenever you replace a pump or torque converter, or whenever you suspect that the fluid has been contaminated. Use J 35944 to flush the cooler.

After filling the transmission with fluid, start the engine and run for 30 seconds. This will remove any residual moisture from the oil cooler. A minimum of two quarts of fluid should flow during a 30-second period. To check the fluid flow, disconnect the return line at the transmission and observe the flow with the engine running. If the fluid flow is insufficient, check the fluid flow by disconnecting the feed line at the cooler. Observe the flow with the engine running.

- If the flow from the cooler return line at the transmission is insufficient, check the flow rate from the feed line to the cooler. Blockage exists in the transmission or the cooler.
- If the flow from the transmission feed line to the cooler is insufficient, the transmission is the cause of the fluid flow problem.
- If the flow from the transmission feed line to the cooler is insufficient, but flow from the cooler return line to the transmission is insufficient, inspect the cooler pipes and fittings. Then repeat the cooler flushing procedure. If the flow is still insufficient, replace the cooler.

FLUID LEAK DIAGNOSIS AND REPAIR

The cause of most external leaks can generally be located and repaired with the transmission in the vehicle.

Methods for Locating Leaks

General Method

1. Verify that the leak is transmission fluid.
2. Thoroughly clean the suspected leak area.
3. Operate the vehicle for about 25 km (15 miles) or until the transmission reaches normal operating temperature (88°C, 190°F).
4. Park the vehicle over clean paper or cardboard.
5. Shut the engine off and look for fluid spots on the paper.
6. Make the necessary repairs to correct the leak.

Powder Method

1. Thoroughly clean the suspected leak area.
2. Apply an aerosol type powder (foot powder) to the suspected leak area.
3. Operate the vehicle for about 25 km (15 miles) or until the transmission reaches normal operating temperature (88°C, 190°F).
4. Shut the engine off.
5. Inspect the suspected leak area and trace the leak path through the powder to find the source of the leak.
6. Make the necessary repairs.

Dye and Black Light Method

1. Add dye to the transaxle though the transmission fill cap. Follow the manufacturer's recommendation for the amount of dye to be used.
2. Use the black light to find the fluid leak.
3. Make the necessary repairs.

Repairing the Fluid Leak

Once the leak point is found the source of the leak must be determined. Figure 10 shows potential leak points for the transaxle. The following list describes the potential causes for the leak:

- Fasteners are not torqued to specification.
- Fastener threads and fastener holes are dirty or corroded.
- Gaskets, seals or sleeves are misaligned, damaged or worn.
- Damaged, warped or scratched seal bore or gasket surface.
- Manual shaft nicked or damaged.
- Loose or worn bearing causing excess seal or sleeve wear.
- Case or component porosity.
- Fluid level too high.
- Plugged vent or damaged vent tube.
- Water or coolant in fluid.
- Fluid drain back holes plugged.

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the car.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.
2. Using instructions from the manufacturer, mix a sufficient amount of epoxy, GM P/N 1052533 or equivalent, to make the repair.

Caution: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before starting the engine.
5. Repeat the fluid leak diagnosis procedures.

4T40-E FLUID LEVEL SERVICE PROCEDURE

The fluid level screw is intended to be used for diagnosing a transaxle fluid leak or resetting the transaxle fluid level after service that involves a loss of fluid.

Fluid Level Diagnosis Procedure

The fluid level should be checked when the transmission is above 40°C (104°F). This temperature can be reached by performing the following procedure.

1. Park the vehicle on a hoist, inspection pit or similar raised level surface. The vehicle must be level to obtain a correct fluid level measurement.
2. Place a fluid container below the fluid level screw.
3. Start the engine and allow the engine to idle for approximately 5 minutes or, if possible, drive the vehicle for a few kilometers to warm the transaxle fluid.
4. With the brake pedal depressed, move the shift lever through the gear ranges, pausing a few seconds in each range. Return the shift lever to the P (Park) position.
5. Remove the fluid level screw. Because the transaxle operates correctly over a range of fluid levels, fluid may or may not drain out of the screw hole when the screw is removed.

Caution: Removal of the fluid level screw when the transmission fluid is hot may cause injury if fluid drains from the screw hole.

- If fluid drains through the screw hole the transaxle may have been overfilled. When the fluid stops draining the fluid level is correct. Install the fluid level screw and torque to the proper specification (12 N•m).
- If fluid does not drain through the screw hole the transaxle fluid level may be low. Add fluid through the fill cap hole in 0.5 liter increments, up to 1.5 liters maximum, until fluid drains through the screw hole. If fluid drains through the screw hole the fluid level was in the correct operating range. Allow the fluid to finish draining through the screw hole and install the fluid level screw. Torque the fluid level screw to the proper specification (12 Nwm).
- If fluid does not drain through the screw hole after adding a total of 1.5 liters then the transaxle was either underfilled or is leaking fluid. The transaxle should be inspected for fluid leaks and any leaks should be fixed before setting the transaxle fluid level.

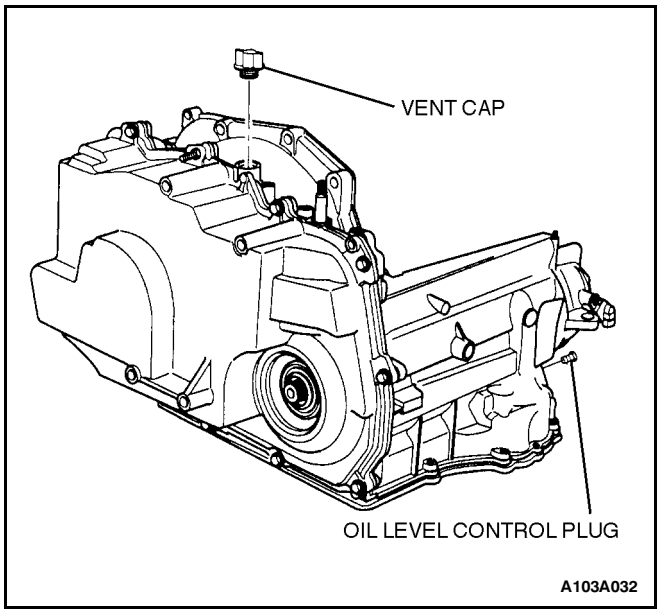
6. When the fluid level checking procedure is completed, wipe any fluid from the transaxle case with a rag or shop towel. Also, check that the fluid fill cap and vent tube are properly installed.

Fluid Level Set After Service

1. Depending on the service procedure performed, add the following amounts of fluid through the fill cap hole prior to adjusting the fluid level:

Bottom pan removal (on-vehicle)	7 liters (7.4 quarts)
New converter	2.5 liters (2.6 quarts)
Complete overhaul	10 liters (10.6 quarts)

2. Follow steps 1 thru 4 of the Fluid Level Diagnosis Procedure.
3. Add additional fluid through the fill cap hole in 0.5 liter (1 pint) increments until fluid comes out the screw hole.



4. Allow the fluid to finish draining out the screw hole, install the fluid level screw and torque the screw to the proper specifications (12 N•m).
5. When the fluid level setting procedure is completed, wipe any fluid from the transaxle case with a rag or shop towel. Also, check that the fluid fill cap and vent tube are properly installed.

ELECTRICAL/GARAGE SHIFT TEST

This preliminary test should be performed before a hoist or road test to make sure electronic control inputs are connected and operating. If the inputs are not checked before operating the transaxle, a simple electrical condition could be misdiagnosed as a major transaxle condition.

A scan tool provides valuable information and must be used on the HYDRA-MATIC 4T40-E transaxle for accurate diagnosis.

1. Move gear selector to P (Park) and set the parking brake.
2. Connect scan tool to DLC terminal.
3. Start engine.
4. Connect power to scan tool.
5. Verify that the appropriate signals are present. These signals may include:
   - ENGINE SPEED
   - TRANS INPUT SPEED
   - TRANS OUTPUT SPEED
   - VEHICLE SPEED
   - TFP RANGE A/B/C
   - PRNDL SELECT
   - DESIRED PCS
   - ACTUAL PCS
   - PCS DUTY CYCLE
   - BRAKE SWITCH
   - ENG COOLANT TEMP
   - TRANS FLUID TEMP
   - THROTTLE ANGLE
   - SYSTEM VOLTS
6. Monitor the BRAKE SWITCH signal while tapping the brake pedal with your foot.
   - The BRAKE SWITCH should be on when the pedal is depressed, and come off when the brake pedal is released.
7. Monitor the PRNDL SELECT signal and move the gear selector through all the ranges.
   - Verify that the PRNDL SELECT value matches the gear range indicated on the instrument panel or console.
   - Gear selections should be immediate and not harsh.
8. Move gear selector to neutral and monitor the THROTTLE ANGLE signal while increasing and decreasing engine RPM with the accelerator pedal.
   - THROTTLE ANGLE should increase with engine RPM.

ROAD TEST PROCEDURE

- Perform the road test using a scan tool.
- This test should be performed when traffic and road conditions permit.
- Observe all traffic regulations.

The TCM calculates upshift points based primarily on two inputs: THROTTLE ANGLE and VEHICLE SPEED. When the TCM says a shift should occur, an electrical signal is sent to the shift solenoids which in turn moves the valves to perform the upshift.

The shift speed charts reference THROTTLE ANGLE instead of "min throttle" or "wot" to make shift speed measurement more uniform and accurate. A scan tool should be used to monitor THROTTLE ANGLE. Some scan tools have been programmed to record shift point information. Check the instruction manual to see if this test is available.

Upshift Procedure

With gear selector in Overdrive (D):

1. Look at the shift speed chart contained in this section and choose a percent throttle angle of 10 or 25%.
2. Set up the scan tool to monitor THROTTLE ANGLE and VEHICLE SPEED.
3. Accelerate to the chosen throttle angle and hold the throttle steady.
4. As the transaxle upshifts, note the shift speed and commanded gear changes for:
   - Second gear.
   - Third gear.
   - Fourth gear.

Important: Shift speeds may vary due to slight hydraulic delays responding to electronic controls. A change from the original equipment tire size also affects shift speeds.

Note when TCC applies. This should occur in fourth gear. If the apply is not noticed by an rpm drop, refer to the "Torque Converter Clutch Diagnosis" information contained in this section.

The TCC should not apply unless the transaxle has reached a minimum operating temperature of 8°C (46°F) TRAN TEMP AND engine coolant temp of 50°C (122°F).

5. Repeat steps 1-4 using several different throttle angles.

Part Throttle Detent Downshift

At vehicle speeds of 64 to 88 km/h (40 to 55 mph) in Fourth gear, quickly increase throttle angle to greater than 50%.

Verify that:

- TCC releases.
- Transaxle downshifts to 3rd gear.
- 1-2 Shift Solenoid turns off.
- 2-3 Shift Solenoid remains on.

Full Throttle Detent Downshift

At vehicle speeds of 64 to 88 km/h (40 to 55 mph) in Fourth gear, quickly increase throttle angle to its maximum position (100%).

Verify that:

- TCC releases.
- Transaxle downshifts to second gear immediately.
- Both Shift Solenoids are off.

Manual Downshifts

The shift solenoids do not control the initial 4-3 manual downshift. The 4-3 manual downshift is hydraulic while the 3-2 and 2-1 are electronic. The solenoid states will change during, or shortly after a manual 4-3 downshift is selected.

1. At vehicle speeds of 64 to 88 km/h (40 to 55 mph) in Fourth gear, release the accelerator pedal while moving the gear selector to Manual Third (3). Observe that:
   - TCC releases.
   - Transaxle downshifts to third gear immediately.
   - Engine slows vehicle down.
2. Move gear selector back to Overdrive (D) and accelerate to 64 to 72 km/h (40 to 45 mph). Release the accelerator while moving the gear selector to Manual Second (2) and observe that:
   - TCC releases.
   - Transaxle downshifts to second gear immediately.
   - Engine slows vehicle down.
3. Move gear selector back to Overdrive (D) and accelerate to 64 km/h (40 mph). Release the accelerator pedal while moving the gear selector to Manual First (1) and observe that:
   - TCC releases.
   - Transaxle downshifts to second gear immediately.
   - Engine slows vehicle down.
   - Below 60 km/h (37 mph) transaxle downshifts to first gear.

Notice: A Manual First-Third Gear Ratio will occur at high speeds as an upshift safety feature. Do not attempt to perform this shift.

Coasting Downshifts

1. With the gear selector in Overdrive (D), accelerate to Fourth gear with TCC applied.
2. Release the accelerator pedal and lightly apply the brakes, and observe that:
   - TCC releases.
   - Downshifts occur at speeds shown on the shift speed chart.

Manual Gear Range Selection

Upshifts in the manual gear ranges are controlled by the shift solenoids.

Perform the following tests by accelerating at 10 percent TP Sensor position.

Manual Third (3)

- With vehicle stopped, move the gear selector to Manual Third (3) and accelerate to observe:
  - 1-2 shift.
  - 2-3 shift.

Manual Second (2)

- With vehicle stopped, move gear selector to Manual Second (2) and accelerate to observe:
  - 1-2 shift.
- Accelerate to 40 km/h (35 mph) and observe:
  - 2-3 shift does not occur.
  - TCC does not apply.

Manual First (1)

- With vehicle stopped, move gear selector to Manual First (1). Accelerate to 32 km/h (20 mph) and observe:
  - No upshifts occur.
  - TCC does not apply.

Reverse (R)

- With vehicle stopped, move gear selector to R (Reverse) and observe:
  - 1-2 Shift Solenoid is ON.
  - 2-3 Shift Solenoid is OFF.

Use a scan tool to see if any transaxle trouble codes have been set. Refer to "Diagnostic Trouble Codes" in this section and repair the vehicle as directed. After repairing the vehicle, perform the hoist test and verify that the code has not set again.

If the transaxle is not performing well and no trouble codes have been set, there may be an intermittent condition. Check all electrical connections for damage or a loose fit. Some scan tools have a snapshot test which can help catch an intermittent condition that does not occur long enough to set a code.

You may want to read "Electronic Component Diagnosis" in this section to become familiar with transaxle conditions caused by transaxle electrical malfunctions.

If no trouble codes have been set and the condition is suspected to be hydraulic, take the vehicle on a road test.

TORQUE CONVERTER CLUTCH (TCC) DIAGNOSIS

To properly diagnose the Torque Converter Clutch (TCC) system, perform all electrical testing first and then the hydraulic testing.

The TCC is applied by fluid pressure which is controlled by a solenoid located inside the Valve Body. The solenoid is energized by completing an electrical circuit through a combination of switches and sensors.

Functional Check Procedure

Inspect

1. Install a tachometer or scan tool.
2. Operate the vehicle until proper operating temperature is reached.
3. Drive the vehicle at 80 to 88 km/h (50 to 55 mph) with light throttle (road load).
4. Maintaining throttle, lightly touch the brake pedal and check for release of the TCC and a slight increase in engine speed (rpm).
5. Release the brake, slowly accelerate and check for a re-apply of the converter clutch and a slight decrease in engine speed (rpm).

TORQUE CONVERTER EVALUATION

Torque Converter Stator

The torque converter stator roller clutch can have one of two different type malfunctions:

1. Stator assembly freewheels in both directions.
2. Stator assembly remains locked up at all times.

Condition A - Poor Acceleration Low Speed

The car tends to have poor acceleration from a standstill. At speeds above 50 to 55 km/h (30 to 35 mph), the car may act normal. If poor acceleration is noted, it should first be determined that the exhaust system is not blocked, and the transaxle is in 1st (First) gear when starting out.

If the engine freely accelerates to high rpm in N (Neutral), it can be assumed that the engine and exhaust system are normal. Checking for poor performance in "Drive" and "Reverse" will help determine if the stator is freewheeling at all times.

Condition B - Poor Acceleration High Speed

Engine rpm and car speed limited or restricted at high speeds. Performance when accelerating from a standstill is normal. Engine may overheat. Visual examination of the converter may reveal a blue color from overheating.

If the converter has been removed, the stator roller clutch can be checked by inserting two fingers into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but not turn or be very difficult to turn counterclockwise.

Noise

Torque converter whine is usually noticed when the vehicle is stopped and the transaxle is in "Drive" or "Reverse". The noise will increase when engine rpm is increased. The noise will stop when the vehicle is moving or when the torque converter clutch is applied because both halves of the converter are turning at the same speed.

Perform a stall test to make sure the noise is actually coming from the converter:

1. Place foot on brake.
2. Put gear selector in "Drive".
3. Depress accelerator to approximately 1200 rpm for no more than six seconds.

Notice: If the accelerator is depressed for more than six seconds, damage to the transaxle may occur.

A torque converter noise will increase under this load.

Important: This noise should not be confused with pump whine noise which is usually noticeable in P (Park), N (Neutral) and all other gear ranges. Pump whine will vary with pressure ranges.

The torque converter should be replaced under any of the following conditions:

- External leaks in the hub weld area.
- Converter hub is scored or damaged.
- Converter pilot is broken, damaged or fits poorly into crankshaft.
- Steel particles are found after flushing the cooler and cooler lines.
- Pump is damaged or steel particles are found in the converter.
- Vehicle has TCC shudder and/or no TCC apply. Replace only after all hydraulic and electrical diagnoses have been made. (Converter clutch material may be glazed.)
- Converter has an imbalance which cannot be corrected. (Refer to Converter Vibration Test Procedure.)
- Converter is contaminated with engine coolant containing antifreeze.
- Internal failure of stator roller clutch.
- Excess end play.
- Heavy clutch debris due to overheating (blue converter).
- Steel particles or clutch lining material found in fluid filter or on magnet when no internal parts in unit are worn or damaged (indicates that lining material came from converter).

The torque converter should not be replaced if:

- The oil has an odor, is discolored, and there is no evidence of metal or clutch facing particles.
- The threads in one or more of the converter bolt holes are damaged.
  - Correct with thread insert.
- Transaxle failure did not display evidence of damage or worn internal parts, steel particles or clutch plate lining material in unit and inside the fluid filter.

- Vehicle has been exposed to high mileage (only). The exception may be where the torque converter clutch damper plate lining has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery or police use.

TCC SHUDDER DIAGNOSIS

The key to diagnosing Torque Converter Clutch (TCC) shudder is to note when it happens and under what conditions.

TCC Shudder should only occur during the APPLY and/or RELEASE of the converter clutch; SELDOM after the TCC plate is fully applied.

While TCC Is Applying Or Releasing:

If the shudder occurs while TCC is applying, the problem can be within the transaxle or torque converter. Something is not allowing the clutch to become fully engaged, not allowing clutch to release, or is trying to release and apply the clutch at the same time. This could be caused by leaking turbine shaft seals, a restricted release orifice, a distorted clutch or housing surface due to long converter bolts, or defective friction material on the TCC plate.

Shudder Occurs After TCC Has Applied:

In this case, most of the time there is nothing wrong with the transaxle! As mentioned above, once the TCC has been applied, it is very unlikely that it will slip. Engine problems may go unnoticed under light throttle and load, but become noticeable after TCC apply when going up a hill or accelerating, due to the mechanical coupling between engine and transaxle.

Important: Once TCC is applied there is no torque converter (fluid coupling) assistance. Engine or driveline vibrations could be unnoticeable before TCC engagement.

Inspect the following components to avoid misdiagnosis of TCC Shudder and possibly disassembling a transaxle and/or replacing a torque converter unnecessarily:

- Spark plugs - Inspect for cracks, high resistance or broken insulator.
- Plug wires - Look in each end. If there is red dust (ozone) or black substance (carbon) present, then the wires are bad. Also look for a white discoloration of the wire indicating arcing during hard acceleration.
- Distributor cap and rotor - Look for broken or uncrimped parts.
- Coil - Look for black on bottom indication arcing while engine is misfiring.
- Fuel injector - Filter may be plugged.
- Vacuum leak - Engine won't get correct amount of fuel. May run rich or lean depending on where the leak is.
- EGR valve - Valve may let in too much unburnable exhaust gas and cause engine to run lean.
- MAP sensor - Like vacuum leak, engine won't get correct amount of fuel for proper engine operation.
- Carbon on intake valves - Restricts proper flow or air/fuel mixture into cylinders.
- Flat cam - Valves don't open enough to let proper fuel/air mixture into cylinders.
- Oxygen sensor - May command engine too rich or too lean for too long.
- Fuel pressure - May be too low.
- Engine mounts - Vibration of mounts can be multiplied by TCC engagement.
- Axle joints - Check for vibration.
- TPS - TCC apply and release depends on TPS in many engines. If TPS is out of specification, TCC may remain applied during initial engine crowd.
- Cylinder balance - Bad piston rings or poorly sealing valves can cause low power in a cylinder.
- Fuel contamination - Causes poor engine performance.

FLEXPLATE/TORQUE CONVERTER VIBRATION TEST PROCEDURE

- Start engine.
- With engine at idle speed and transaxle in P (Park) or N (Neutral), observe vibration.
- Key off.

Remove or Disconnect

1. Flexplate shield attaching bolts.
2. Flexplate to torque converter attaching bolts.
3. Rotate torque converter 120 degrees (1/3 turn).

Install or Connect

1. Flexplate to torque converter attaching bolts.

   Tighten

   w Bolts to 62 Nwm (46 lb. ft.)
2. Flexplate shield attaching bolts.
   - Start engine and check for vibration. Repeat procedure until best possible balance is obtained.

HYDRA-MATIC 4T40-E SHIFT SPEED CHART

Upshift Speed Information

MODEL	1-2 SHIFT () /* 3 MPH)				2-3 SHIFT () /* 4 MPH)				3-4 SHIFT () /* 5 MPH)		
	10% TPS	25% TPS	50% TPS	100% TPS	10% TPS	25% TPS	50% TPS	100% TPS	10% TPS	25% TPS	50% TPS
WAR	8.0	12.5	20.0	28.5	16.0	25.0	39.0	54.0	26.0	36.0	57.0

Transaxle Usage and Downshift Speed Information

MODEL	SERIES	ENGINE		DOWNSHIFTS () /* 4 MPH)			TCC APPLY 4TH GEAR		TCC RELEASE 4TH GEAR	
		DISP.	RPO	4-3 COAST	3-2 COAST	2-1 COAST	10% TPS	25% TPS	10% TPS	25% TPS
WAR	DAEWOO	-	-	24	12.5	7	39	47	36	41

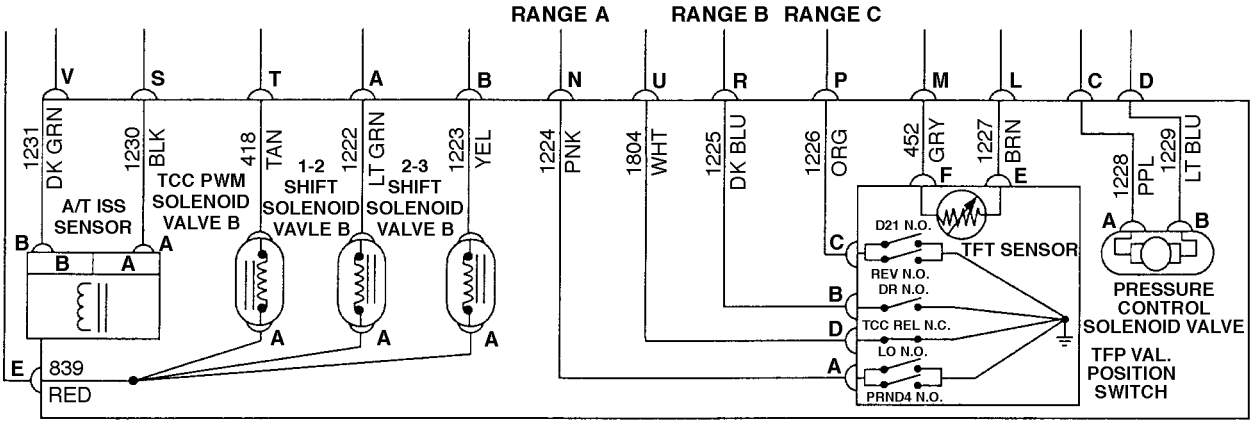
INTERNAL WIRING HARNESS CHECK

Step	Action	Value(s)	Yes	No
1	1. Install J 39775 Jumper Harness on the transmission 20-way connector, if needed. 2. Using J 39200 DVOM and J 35616 Connector Test Adapter Kit, measure the resistance between terminals A and E: the 1-2 Shift Solenoid Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 3	Go to Step 2
2	1. Disconnect the internal transmission harness from the 1-2 Shift Solenoid Valve. 2. Using J 39200 DVOM, measure the resistance of the 1-2 Shift Solenoid Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
3	Measure the resistance between terminals B and E: the 2-3 Shift Solenoid Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 5	Go to Step 4
4	1. Disconnect the internal transmission harness from the 2-3 Shift Solenoid Valve. 2. Using J 39200 DVOM, measure the resistance of the 2-3 Shift Solenoid Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
5	Measure the resistance between terminals T and E: the TCC Sol. Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 7	Go to Step 6
6	1. Disconnect the internal transmission harness from the TCC Sol. Valve. 2. Using J 39200 DVOM, measure the resistance of the TCC Sol. Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
7	Measure the resistance between terminals C and D: the TCC Sol. Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 9	Go to Step 8

Internal Wiring Harness Check (Cont'd)

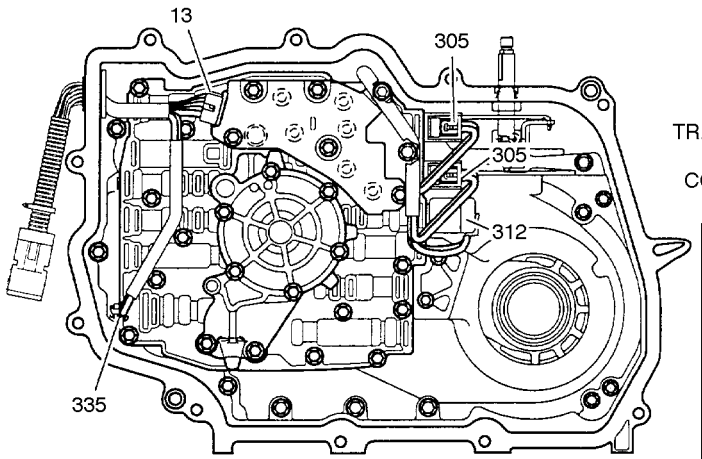
Step	Action	Value(s)	Yes	No
8	1. Disconnect the internal transmission harness from the Pressure Control Solenoid Valve. 2. Using J 39200 DVOM, measure the resistance of the Pressure Control Solenoid Valve. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
9	Measure the resistance between terminals S and V: the A/T ISS. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 11	Go to Step 10
10	1. Disconnect the internal transmission harness from the A/T ISS. 2. Using J 39200 DVOM, measure the resistance of the A/T ISS. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
11	Measure the resistance between terminals M and L: the TFT Sensor. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 13	Go to Step 12
12	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Using J 39200 DVOM, measure the resistance of the TFT Sensor by placing the meter leads between terminals E and F of the TFP Val. Position Sw. Is the resistance within the values shown?	Refer to Component Resistance Chart	Go to Step 14	Go to Step 16
13	Using J 39200 DVOM and J 35616 Connector Test Adapter Kit, measure the resistance of the internal transmission harness from pins A, B, C, D, E, L, M, S, T, and V of the transmission 20-way connector to the transmission case. Is the resistance more than shown?	Refer to Component Resistance Chart	No problem found, exit table	Go to Step 15
14	Inspect for resistance: • Inspect the transmission wiring for poor electrical connections at the transmission 20-way connector and at the component connectors. • Look for possible bent, backed out, deformed, or damaged terminals. • Check for weak terminal tension. Was the condition found?	-	Verify repair and Go to Step 1	Go to Step 15
15	Replace the internal wiring harness. Is the replacement complete?	-	Verify repair and Go to Step 1	-
16	Replace the component. Is the replacement complete?	-	Verify repair and Go to Step 1	-

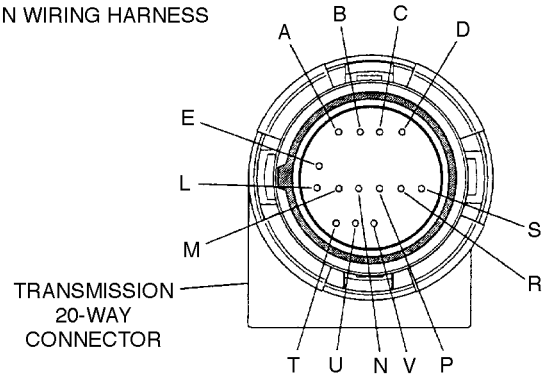
WIRING DIAGRAM



INTERNAL TRANSMISSION WIRING HARNESS

N.C. = NORMALLY CLOSED SWITCH
N.O. = NORMALLY OPEN SWITCH





13 TFP VALVE POSITION SWITCH
305 SOLENOID, SHIFT (1-2 & 2-3)
312 SOLENOID, PRESSURE CONTROL
335 SOLENOID, TCC CONTROL

CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID VALVE
B	2-3 SHIFT SOLENOID VALVE
C	PRESSURE CONTROL SOLENOID (HIGH) VALVE
D	PRESSURE CONTROL SOLENOID (LOW) VALVE
E	BOTH SHIFT SOLENOIDS AND TCC SOLENOID VALVE
L	TRANSMISSION FLUID TEMPERATURE SENSOR (HIGH)
M	TRANSMISSION FLUID TEMPERATURE SENSOR (LOW)
N	RANGE SIGNAL "A"
P	RANGE SIGNAL "C"
R	RANGE SIGNAL "B"
S	INPUT (SHAFT) SPEED SENSOR (HIGH)
T	TCC SOLENOID VALVE
U	TCC RELEASE SWITCH
V	INPUT (SHAFT) SPEED SENSOR (LOW)

A103A033

4T40-E COMPONENT RESISTANCE CHART

Component	Pass Through Pins	Resistance 20°C (68°F) Ohms	Resistance 100°C (212°F) Ohms	Resistance to Ground (Case) Ohms
1-2 Shift Solenoid Valve	A, E	19-24W	24-31W	Greater than 250KW
2-3 Shift Solenoid Valve	B, E	19-24W	24-31W	Greater than 250KW
TCC Sol. Valve	T, E	10-11W	13-15W	Greater than 250KW
PC Sol. Valve	C, D	3-5W	4-7W	Greater than 250KW
Automatic Transmission Fluid Pressure Manual Valve Position Switch	Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Resistance Check			
*Transmission Fluid Temperature Sensor	M, L	3106-3923W	164-190W	Greater than 20MW
A/T ISS	S, V	615-700W	750-835W	Greater than 10MW
A/T OSS	A, B (OSS) CONN	1530-1650W	1700-1870W	Greater than 10MW

*NOTE: The resistance of this device is necessarily dependent on the temperature. Therefore the resistance will vary far more than any other device.

AUTOMATIC TRANSMISSION FLUID PRESSURE MANUAL VALVE POSITION SWITCH RESISTANCE CHECK

Step	Action	Value(s)	Yes	No
1	1. Install J 39775 Jumper Harness on the transmission 20-way connector, if needed. 2. Using J 39200 DVOM and J 35616 Connector Test Adapter Kit, measure the resistance from terminal U and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 3	Go to Step 2
2	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal D and the TFP Val. Position Sw. housing. Is the resistance less than the value shown?	50W	Go to Step 15	Go to Step 17
3	Measure the resistance from terminal N and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 5	Go to Step 4
4	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal A and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
5	Measure the resistance from terminal R and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 7	Go to Step 6

Automatic Transmission Fluid Pressure Manual Valve Position Switch Resistance Check (Cont'd)

Step	Action	Value(s)	Yes	No
6	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal B and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
7	Measure the resistance from terminal P and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 9	Go to Step 8
8	1. Disconnect the internal transmission harness from the TFP Val. Position Sw. 2. Measure the resistance from terminal C and the TFP Val. Position Sw. housing. Is the resistance more than the value shown?	50KW	Go to Step 15	Go to Step 17
9	1. Start the engine and let the engine idle. 2. Set the parking brake. 3. Place the gear selector in P (Park). 4. Measure the resistance from terminal U and the transmission case. Is the resistance more than the value shown?	50KW	Go to Step 10	Go to Step 17
10	1. Place the gear selector in R (Reverse). 2. Measure the resistance from terminal P and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 11	Go to Step 17
11	1. Place the gear selector in D4 (Drive). 2. Measure the resistance from terminal N and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 12	Go to Step 17
12	Measure the resistance from terminal R and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 13	Go to Step 17
13	1. Place the gear selector in D1 (Low). 2. Measure the resistance from terminal N and the transmission case. Is the resistance less than the value shown?	50W	Go to Step 14	Go to Step 17
14	Measure the resistance from terminal P and the transmission case. Is the resistance less than the value shown?	50W	No problem found; exit table	Go to Step 17
15	Inspect for high resistance: • Inspect the transmission wiring for poor electrical connections at the transmission 20-way connector and at the TFP Val. Position Sw. connector. • Look for possible bent, backed out, deformed, or damaged terminals. • Check for weak terminal tension. Was the condition found?	-	Verify repair and Go to Step 1	Go to Step 16
16	Replace the internal wiring harness. Is the replacement complete?	-	Verify repair and Go to Step 1	-
17	Replace the TFP Val. Position Sw. Is the replacement complete?	-	Verify repair and Go to Step 1	-

SYMPTOM DIAGNOSIS

HIGH OR LOW LINE PRESSURE

Condition	Inspect Component	For Cause
HIGH OR LOW LINE PRESSURE (Verify With Gauge) (All Shifts Harsh or Soft) Possible Codes: 712 Trans Fluid Temp Sensor Circuit - Low Input 713 Trans Fluid Temp Sensor Circuit - High Input 716 A/T Input Speed Sensor Circuit - Range/ Performance 717 A/T Input Speed Sensor Circuit - Malfunction 722 A/T OSS - Malfunction 723 A/T OSS - Intermittent/Erratic 727 Engine Speed Sensor Low 730 Undefined Gear Ratio 742 TCC Circuit Stuck ON 748 PCS Circuit - Malfunction 751 1-2 Shift Solenoid Performance Fault 756 2-3 Shift Solenoid Performance 1810 TFP Malfunction 1811 Max Adapt/Longshift 1887 TCC Release Switch Malfunction	Oil Level	• High or Low: correct as required.
	Pressure Regulator Valve (328) Springs (326, 327) Boost Valve (325)	• Stuck.
	Pressure Control Solenoid (312)	• Leak, O-rings damaged. • Loose connector, pins damaged. • Contaminated.
	Torque Signal Regulator Valve (309)	• Stuck.
	Transmission Wiring Harness (11)	• Loose connector at vehicle harness, short.
	Transmission Fluid Pressure Switch (13)	• Loose connector. • Damaged or missing O-ring.
	Throttle Position Sensor	• Damaged, sticking, disconnected. • Intermittent open or shorted circuit.
	Oil Filter (85)	• Clogged, broken, loose.
	Oil Filter Seal (84)	• Leaking.
	Cooler Lines	• Clogged or restricted.
	Cooler Line Seals (49)	• Leaking.
	Oil Pump (10)	• Damaged, sticking, porosity, leaking.
	Oil Pump Drive Shaft (19)	• Damaged.
	Pressure Relief Valve (214)	• Damaged sprimg, ball missing.
	Transaxle Case (1) Valve Body (18) Channel Plate (27)	• Porosity, leaking circuits. • Flatness of machined surfaces.

INACCURATE/INCONSISTENT SHIFT POINTS

Condition	Inspect Component	For Cause
INACCURATE / INCONSISTENT SHIFT POINTS Possible Codes: 716 A/T Input Speed Sensor Circuit - Range/Performance 717 A/T Input Speed Sensor Circuit - Malfunction 722 A/T OSS - Malfunction 723 A/T OSS - Intermittent/ Erratic 751 1-2 Shift Solenoid Performance Fault 756 2-3 Shift Solenoid Performance	Shift Solenoids (305)	• Contamination. • Intermittent open or shorted circuit.
	Throttle Position Sensor	• Damaged, disconnect. • Intermittent open or shorted circuit.
	Output Speed Sensor (62) Input Speed Sensor (46)	• Damaged, disconnected, loose. • Intermitten open or shorted circuit.

HARSH SHIFTS

Condition	Inspect Component	For Cause
HARSH SHIFTS (General)	Line Pressure	• High (See High Line Pressure).
	Checkballs (26)	• Missing, no orifice applied.
	Accumulators	• Springs or piston binding; no accumulation. • Accumulator valve stuck.
	Clutch Housing Retainer and Ball Assemblies	• Plugged.

NO REVERSE, SLIPS IN REVERSE

Condition	Inspect Component	For Cause
NO REVERSE, SLIPS IN REVERSE Possible Codes: 1810 TFP Malfunction with Input Speed Sensor	Reverse Clutch • Piston and Seal Assembly (457) • Inner Seal (456) • Clutch Plates (460-463) • Snap Ring (459, 464) • Housing • Housing Retainer and Ball Assembly • Springs (458)	• No apply/slipping. • Binding, cracked, leaking. • Orifice plugged. • Friction worn, splines broken. • Out of position. • Cracked, feed holes plugged, tangs broken. • Missing/out of position. • Binding.
	Reverse Clutch Fluid Routing • Driven Sprocket Support (95) • Channel Plate & Gasket, Valve Body, Gaskets and Channel Plate	• Fluid leak/restriction. • Seal rings leaking. • Porosity, damaged, misaligned. • Porosity, fluid leak across channels, misaligned, damaged, fluid restriction.
	Lo & Reverse Band and Servo • Servo Piston (69) • Servo Piston Seals (71, 72) • Servo Pin (67) and Springs (66, 68) • Servo Cover (73) • Lo & Reverse Band (111) • Anchor Pin (64) • Fluid Feed Tubes (83) • Transaxle Case (1)	• No apply/slipping. • Broken, binding. • Leaking. • Binding. • Broken, loose, leaking. • Broken, worn, out of position. • Broken. • Broken, bent, plugged, seal rings missing/leaking. • Porosity, fluid leak or restriction.
	Shift Linkage	• Disconnected, misaligned.
	Manual Valve (800) Link (802)	• Disconnected, misaligned.
	#1 Checkball (LO/PRN)	• Missing (No LO Band Fluid).
	Fluid Level	• Low.
	Fluid Pressure	• Low (See Low Fluid Pressure).

NO FIRST GEAR, SLIPS IN FIRST GEAR

Condition	Inspect Component	For Cause
NO FIRST GEAR, SLIPS IN FIRST GEAR Possible Codes: 716 A/T Input Speed Sensor Circuit - Range/Performance 717 A/T Input Speed Sensor Circuit - Malfunction 722 A/T OSS - Malfunction 723 A/T OSS Circuit- Intermittent/Erratic 730 Undefined Gear Ratio 751 1-2 Shift Solenoid Performance Fault 756 2-3 Shift Solenoid Performance 1810 PSA Malfunction with Input Speed Sensor	Forward Clutch • Piston and Seal Assembly (607) • Inner Seal (608) • Clutch Plates (601-604) • Snap Ring (600, 605) • Housing (609) • Housing Retainer and Ball Assembly • Springs (606)	• No apply/slipping. • Binding, cracked, leaking. • Orifice plugged. • Splines, broken, friction worn. • Out of position. • Cracked, feed holes plugged. • Missing, out of position. • Binding.
	Input Sprag (515)	• Damaged, not holding.
	LO Roller Clutch (652)	• Damaged, not holding.
	Forward Clutch Fluid Routing • Oil Feed Tubes (83) • Forward Clutch Support (114) • Channel Plate (27) and Gasket (28) • TFP (13)	• Fluid leak or restriction. • Bent, broken, seal rings leaking, plugged. • Porosity, seal rings leaking, damaged, feed holes plugged. • Porosity, misaligned, fluid leak across channels or restriction. • Drive switch O-ring leaking.
	1-2 Shift Solenoid (305)	• Failed OFF, leaking.
	1-2 Shift Valve (302)	• Stuck in upshifted position.
	2-3 Shift Solenoid (305)	• Failed ON, exhaust plugged.
	Manual Valve (800)/Shift Linkage	• Misaligned.
	Torque Converter (55)	• Stator roller clutch not holding.
	Line Pressure	• Low (See Low Line Pressure).

NO SECOND GEAR, SLIPS IN SECOND GEAR

Condition	Inspect Component	For Cause
NO SECOND GEAR, SLIPS IN SECOND GEAR Possible Codes: 730 Undefined Gear Ratio 751 1-2 Shift Solenoid Performance	2nd Clutch • Piston and Seal Assembly (404) • Clutch Plates (96-99) • Snap Ring (406) • Springs (405) • Driven Sprocket Support (95)	• No apply/slipping. • Binding, cracked, leaking. • Friction worn, splines broken. • Out of position. • Binding. • Damaged, leaking, porosity.
	2nd Clutch Fluid Routing	• Fluid leak or restriction.
	Valve Body Gaskets & Spacer Plate Channel Plate & Gasket Driven Sprocket Support	• Porosity, misaligned, loose, restriction, fluid leak across channels.
	2nd Roller Clutch (452)	• Damaged, not holding.
	1-2 Shift Solenoid (305)	• Stuck ON, plugged.
	Forward Clutch	• Low capacity shows up in 2nd gear.
	Line Pressure	• Low (See Low Line Pressure).

No Second Gear, Slips in Second Gear (Cont'd)

Condition	Inspect Component	For Cause
NO SECOND GEAR, SLIPS IN SECOND GEAR (Continued)	1-2 Accumulator (29-31)	• Leak at piston seal. • Channel plate/case porosity.
	1-2 Accumulator Valve (323)	• Stuck.
	2-3 Shift Valve (306)	• Stuck in upshifted position.
	TFP (13)	• Malfunction (Electrical or Hydraulic)

NO THIRD GEAR, SLIPS IN THIRD GEAR

Condition	Inspect Component	For Cause
NO THIRD GEAR, SLIPS IN THIRD GEAR Possible Codes: 756 2-3 Shift Solenoid Performance 1871 Undefined Gear Ratio	Direct Clutch • Piston and Seal Assembly (518) • Clutch Plates (521-523) • Snap Ring (520) • Springs (519) • Direct & Coast Housing and Input Shaft (520) • Housing Retainer and Ball Assembly	• No apply/slipping. • Binding, cracked, leaking. • Friction worn, splines broken. • Out of position. • Binding. • Damaged, cracked, feed holes restricted. • Missing, loose.
	Direct Clutch Fluid Routing • Valve Body Gaskets & Spacer Plate Channel Plate & Gasket Driven Sprocket Support • Driven Sprocket Support Seals • Input Shaft	• Porosity, misaligned, loose, fluid restriction, fluid leak across channels. • Leaking. • Seals leaking. • Sleeve damaged, misaligned.
	2-3 Shift Solenoid (305)	• Stuck OFF, leaking.
	2-3 Accumulator	• Leak at piston seal. • Channel plate/case porosity.
	2-3 Accumulator Valve (330)	• Stuck.
	Line Pressure	• Low (See Low Line Pressure).
	3-4 Shift Valve (319)	• Stuck in upshifted position.
	TFP (13)	• Malfunction (Electrical or Hydraulic).

SECOND GEAR ONLY

Condition	Inspect Component	For Cause
SECOND GEAR ONLY	1-2 Shift Valve (302)	• Stuck in downshifted position.

NO FOURTH GEAR, SLIPS IN FOURTH GEAR

Condition	Inspect Component	For Cause
NO FOURTH GEAR, SLIPS IN FOURTH GEAR Possible Codes: 751 1-2 Shift Solenoid Performance Fault 1871 Undefined Gear Ratio	Intermediate/4th Band & Servo • Servo Piston (77) • Servo Piston Seals (78, 79) • Servo Pin (76) Springs (75, 68) • Servo Cover (80) • Band (100) • Case (1)	• No apply/slipping. • Broken, binding. • Leaking. • Binding. • Broken, loose, leaking. • Broken, worn, out of position. • Cracket at band seat.
	Band Apply Fluid Routing • Valve Body Gaskets & Spacer Plate Channel Plate; Gasket	• Porosity, misaligned, loose, fluid restriction, fluid leak across channels.
	1-2 Shift Solenoid (305)	• Stuck OFF, leaking.
	3-4 Shift Valve (319)	• Stuck in downshifted position.
	Manual Valve (800)	• Misaligned (in Manual Third).
	3-4 Accumulator	• Leak at piston seal. • Channel plate/case porosity.
	3-4 Accumulator Valve (323)	• Stuck.
	Line Pressure	• Low (See Low Line Pressure).
	Direct Clutch	• Low capacity will cause failure in Fourth gear.
	TFP (13)	• Malfunction (Electrical or Hydraulic).

LOSS OF DRIVE

Condition	Inspect Component	For Cause
LOSS OF DRIVE	Torque Converter (55)	• Broken lugs, failed lug weld. • Sheared lug bolts. • Worn turbine shaft splines. • Internal failure. • Cracked cover at weld.
	Axles	• Damaged, splines worn, loose.
	Turbine Shaft (39)	• Stripped splines.
	Oil Pump (10)	• Seized, broken pump gears.
	Oil Pump Shaft (19)	• Broken, stripped splines.
	Filter and Filter Seal (85, 84)	• Plugged, missing.
	Fluid Level	• Low.
	Shift Linkage	• Disconnected.
	Drive/Driven Sprockets and Drive Chain (36, 37, 91)	• Broken.
	Planetary Gears	• Failure, lack of lube.
	Final Drive	• Gear failure, lack of lube.

Loss of Drive (Cont'd)

Condition	Inspect Component	For Cause
LOSS OF DRIVE (Continued)	Channel Plate and Gasket (28)	• Damaged, leaking, misaligned.
	Valve Body Gaskets and Spacer Plate	• Damaged, leaking, misaligned.
	Forward Sprag Clutch Forward Clutch LO Roller Clutch	• Damaged, not holding. (See No First Gear)
	Hydraulic System	• Tie up, fluid circuit leaks.

LOSS OF POWER

Condition	Inspect Component	For Cause
LOSS OF POWER Possible Codes: 751 1-2 Shift Solenoid Performance Fault 756 2-3 Shift Solenoid Performance	Fluid Level	• Low.
	Shift Solenoids (305)	• Failed OFF, 2nd gear start. • 2-3 Shift Solenoid, failed ON.
	TCC System	• TCC stuck ON or dragging.
	Torque Converter (55)	• Contaminated, damaged.

ENGINE STALL

Condition	Inspect Component	For Cause
ENGINE STALL Possible Codes: 742 TCC Circuit Stuck ON	TCC System • TCC Solenoid (335) • TCC-Regulated Apply Valve (339)	• TCC stuck ON or dragging. • Stuck ON, solenoid exhaust plugged. • Stuck in apply position.

FIRST AND SECOND GEARS ONLY

Condition	Inspect Component	For Cause
1ST AND 2ND GEARS ONLY Possible Codes: 756 2-3 Shift Solenoid Performance	2-3 Shift Solenoid (305)	• Stuck OFF, solenoid leaking, electrical.
	2-3 Shift Valve (307)	• Stuck in downshifted position.
	Direct Clutch	• Failed clutch (released).

THIRD AND FOURTH GEARS ONLY

Condition	Inspect Component	For Cause
3RD AND 4TH GEARS ONLY Possible Codes: 756 2-3 Shift Solenoid Performance	2-3 Shift Solenoid (305)	• Stuck ON, solenoid plugged, electrical.
	1-2 and 2-3 Shift Valves	• Both stuck in upshifted position.

FIRST AND FOURTH GEARS ONLY

Condition	Inspect Component	For Cause
1ST AND 4TH GEARS ONLY Possible Codes: 751 1-2 Shift Solenoid Performance Fault	1-2 Shift Solenoid (305)	• Stuck ON, electrical, solenoid plugged.

SECOND AND THIRD GEARS ONLY

Condition	Inspect Component	For Cause
2ND AND 3RD GEARS ONLY Possible Codes: 751 1-2 Shift Solenoid Performance Fault	1-2 Shift Solenoid (305)	• Stuck OFF, electrical, solenoid leaking.

NO PARK

Condition	Inspect Component	For Cause
NO PARK	Parking Lock Actuator Assembly (807)	• Rod bent or damaged. • Spring binding or broken. • Rod not attached to detent lever.
	Detent Roller and Spring (804)	• Bolt not torqued, loose. • Bent, damaged.
	Detent Lever (806)	• Damaged, loose (manual shift pin missing).
	Manual Valve (800)	• Misaligned, manual valve to detent lever link bent.
	Park Lock Gear (659)	• Damaged teeth, splines damaged.
	Parking Lock Pawl (663)	• Damaged, tooth broken.
	Park Pawl Spring (662)	• Broken, missing.
	Shift Linkage	• Misadjusted.

RATCHETING NOISE

Condition	Inspect Component	For Cause
RATCHETING NOISE	Parking Pawl (663)	• Return spring damaged, weak or misassembled.

NO ENGINE BRAKING; ALL MANUAL RANGES

Condition	Inspect Component	For Cause
NO ENGINE COMPRESSION BRAKING: ALL MANUAL RANGES	Coast Clutch • Piston and Seal Assembly (504) • Clutch Plates (508, 509) • Springs (505) • Direct & Coast Clutch Housing and Input Shaft (502) • Housing Retainer and Ball Assembly	• No apply/slipping. • Binding, cracked, leaking. • Friction worn, splines broken. • Binding. • Damaged, cracked, fluid feed holes restricted. • Missing, loose.
	Coast Clutch Fluid Routing • Valve Body Gaskets and Spacer Plate Channel Plate & Gasket Driven Sprocket Support • Driven Sprocket Support Seals • Input Shaft (502)	• Porosity, misaligned, loose, fluid restriction, fluid leak across channels. • Leaking. • Seals leaking. • Sleeve damaged, misaligned.
	Oil Level/Line Pressure	• Low (See Low Line Pressure).
	3-4 Shift Valve (319)	• Stuck in 4th gear position. (No coast clutch apply).
	Manual Valve/Shift Linkage (800)	• Misaligned.

NO ENGINE BRAKING; MANUAL SECOND - SECOND GEAR

Condition	Inspect Component	For Cause
NO ENGINE COMPRESSION BRAKING: MANUAL SECOND - SECOND GEAR Possible Codes: 1810 TFP Malfunction	Coast Clutch	• No apply/slipping. (See No Engine Compression Braking: All Ranges).
	Intermediate/4th Band (100)	• No apply/slipping (See No 4th Gear: Intermediate/4th Band - No apply).
	TFP (13)	• Leaking, inoperative.
	A/T OSS (62)	• Reads 0 mph.

NO ENGINE BRAKING; MANUAL FIRST - FIRST GEAR

Condition	Inspect Component	For Cause
NO ENGINE COMPRESSION BRAKING: MANUAL FIRST - FIRST GEAR Possible Codes: 1810 TFP Malfunction	Coast Clutch	• No apply/slipping. (See No Engine Compression Braking: All Ranges).
	LO & Reverse Servo	• No apply/slipping (See No Reverse: LO & Reverse Band - No apply/slipping).
	TFP (13)	• Leaking, inoperative.
	#1 Checkball (LO/PRN)	• Missing.

DRIVES IN NEUTRAL

Condition	Inspect Component	For Cause
DRIVES IN NEUTRAL	Forward Clutch (Drives Forward)	• Not releasing.
	Reverse Clutch LO & Reverse Servo (Drives in Reverse)	• Both not releasing. • Misaligned.

NO GEAR SELECTION

Condition	Inspect Component	For Cause
NO GEAR SELECTIONS	Manual Valve to Detent Lever Link (802)	• Broken, missing. • Disconnected from manual valve.
	Manual Valve to Link Clip (801)	• Disconnected.
	Manual Valve (800)	• Stuck.
	Shift Linkage	• Disconnected.
	Valve Body Channel Plate and Case	• Blocked fluid channels.

SHIFT INDICATOR INDICATES WRONG GEAR SELECTION

Condition	Inspect Component	For Cause
SHIFT INDICATOR INDICATES WRONG GEAR SELECTION	Indicator Linkage	• Misadjusted.
	Detent Spring and Roller Assembly (804)	• Broken, missing. • Bolt loose.
	Manual Valve	• Not connected to detent lever.

FLUID LEAKS

Condition	Inspect Component	For Cause
FLUID LEAKS	Refer to Fluid Leak Diagnosis in this section.	

FLUID FOAMING

Condition	Inspect Component	For Cause
FLUID FOAMING	Fluid	• Degraded fluid. • Contaminate (Antifreeze). • Transaxle overfilled.
	Cooler Lines	• Plugged.
	Transaxle Oil Filter (85)	• Clogged. • Cracked.
	Filter Seal (84)	• Leaking.
	Side Cover Seal (6)	• Damaged.
	Engine	• Overheated.
	Vehicle	• Overloaded.
	Oil Level Control Valve (86)	• Damaged, loose.

VIBRATION

Condition	Inspect Component	For Cause
VIBRATION	Torque Converter (55)	• Out of balance. • Internal failure.
	Transaxle/Engine	• Misaligned.
	Output (94)/Stub Shafts (58)	• Out of balance. • Bushings worn or damaged.
	Turbine Shaft (39)	• Worn bushings. • Out of balance.

NOISE

Condition	Inspect Component	For Cause
NOISE - In All Ranges or a WHINE which may be rpm or load sensitive or ceases when TCC engages.	Torque Converter (55)	• Verify noise internal to torque converter by placing left foot on brake with gear or selector in Drive and momentarily stall engine. Torque converter noise increases under load.
A high pitch WHINE which will intensify with engine rpm or is oil pressure sensitive.	Oil Pump System	• Verify noise internal to oil pump during preliminary oil pressure check. An increase in line pressure will vary an oil pump noise.
A popping noise similar to popcorn popping.	Oil Pump System	• Pump cavitation - indicated by bubbles in fluid. • Transaxle fluid filter for seam leak. • Transaxle fluid filter seal for proper positioning or cut seal,
A BUZZ or high frequency rattle sound.	Trace cooler pipes and check for binding or contact at the radiator other than the cooler pipe connectors.	• Verify pressure buzz by watching for a needle vibration on the pressure gauge. (Road test may be necessary.)
A WHINE or GROWL that increases and fades with vehicle speed and is most noticeable under light acceleration.	Drive Link Assembly System Verify noise from sprockets and/or drive link assembly (chain) by placing left foot on brake and moving gear selector from P (Park) or R (Reverse). If noise stops check items below:	
	Drive Chain (36)	• Stretched.
	Drive Sprocket (37) Driven Sprocket (91)	• Teeth broken or sheared. • Bearing surfaces nicked or scored. • Bearing race or roller bearing surfaces on gear support inner bearing rough or pitted. • Bearing damage.
	Drive Sprocket Support (43) Driven Sprocket Support (95)	• Bearing outer race support rough or nicked.

Noise (Cont'd)

Condition	Inspect Component	For Cause
NOISE - (Continued) A final drive noise or HUM, is most noticeable under light throttle acceleration and/or turns.	Final Drive Gear Set (116) Final Drive Internal Gear (118)	• Worn, planet pinions or washers. • Worn, tooth damage.
	Differential Carrier (116) Differential Side Gears (709)	• Gears worn or pitted. • Thrust washer damage.
Noise in 1st, 2nd, 3rd or 4th.	Final Drive Sun Gear (115)	• Gear worn or damage.
	Final Drive Pinions (707)	• Gears worn or damaged.
Noise only in certain gear ranges.	Check Range Reference Chart. Determine power flow and applicable components that may be causing noise.	

NO TCC/SLIPPING/SOFT APPLY

Condition	Inspect Component	For Cause
NO TCC/SLIPPING/SOFT APPLY Possible Codes: 703 Brake Switch Malfunction 712 Trans Fluid Temp Sensor Circuit - Low Input 713 Trans Fluid Temp Sensor Circuit - High Input 716 A/T Input Speed Sensor Circuit - Range/Performance 717 A/T Input Speed Sensor Circuit - Malfunction 722 A/T OSS - Malfunction 723 A/T OSS - Intermittent/Erratic 726 Engine Speed Sensor Circuit - Intermittent 727 Engine Speed Sensor Low 742 TCC Circuit Stuck ON 751 1-2 Shift Solenoid Performance 756 2-3 Shift Solenoid Performance 1810 TFP Malfunction 1812 Trans Fluid Overtemp 1887 TCC Release Switch Malfunction	TCC Solenoid (335)	• Stuck OFF. • O-ring leaking. • No voltage to solenoid. • Poor electrical connection.
	Wiring Harness (11)	• Pinched wire (electrical short). • Damaged electrical connector.
	TCM	• No signal to solenoid.
	Brake Switch	• Not functioning (open).
	Pressure Regulator Valve	• Stuck.
	Torque Converter (55)	• Internal failure.
	TCC Fluid Circuits	• Leaks (Refer to Oil Flow Diagrams). • Plugged release exhaust orifice.
	TCC-Regulated APply Valve (339) TCC Control Valve (334)	• Stuck in TCC release position.
	TCC Feed Limit Valve	• Stuck.
	Fluid Level or Pressure	• Low.
	Cooler Lines	• Plugged.

NO TCC RELEASE

Condition	Inspect Component	For Cause
NO TCC RELEASE	TCC Solenoid (335)	• Internal failure. • Fluid exhaust plugged. • External ground.
	Torque Converter (55)	• Internal failure.
	TCC-Regulated Apply Valve (339) TCC Control Valve (334)	• Stuck in TCC apply position.

TCC APPLY WITH COLD ENGINE

Condition	Inspect Component	For Cause
TCC APPLY WITH COLD ENGINE	Engine Coolant Temp Sensor	• Malfunction.

TCC SHUDDER

Condition	Inspect Component	For Cause
TCC SHUDDER	Refer to TCC Shudder Diagnosis in this section.	

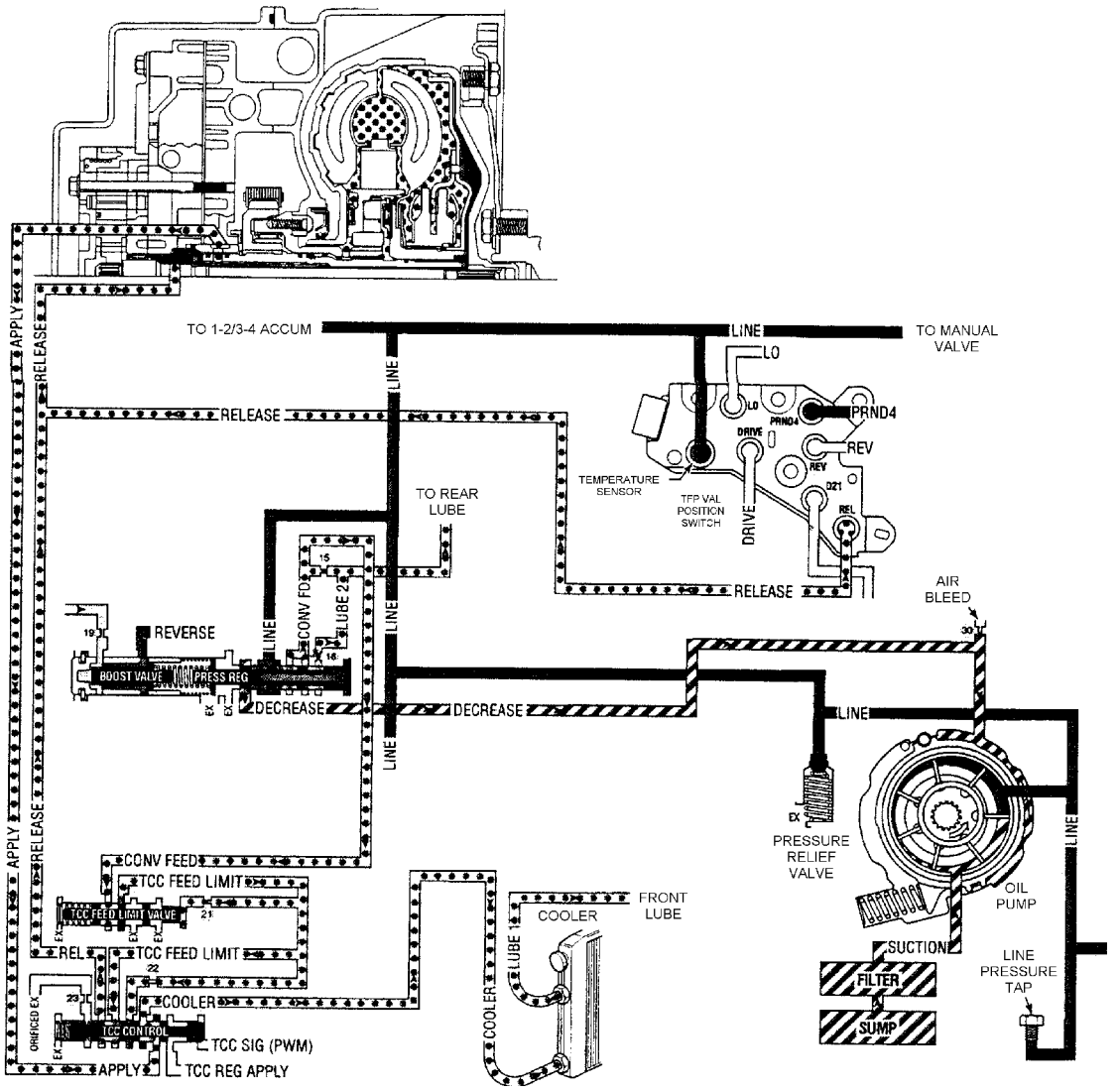
DIAGNOSTIC TROUBLE CODE DIAGNOSIS

DIAGNOSTIC TROUBLE CODE (DTC) IDENTIFICATION

DTC	Description	Power Lamp	Default Action
P0218	Transmission Fluid Overtemperature	Off	• DTC P0218 will be stored in TCM memory. • Freeze shift adapts.
P0711	Transmission Fluid Temperature Sensor Circuit Range/Performance	Flashing	• DTC P0711 will be stored in TCM memory. • Freeze shift adapts. • Transmission default temperature calculated based on engine coolant temperature, manifold air temperature, and engine run time.
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	Off	• DTC P0712 will be stored in TCM memory. • Freeze shift adapts. • Transmission default temperature calculated based on engine coolant temperature, manifold air temperature, and engine run time.
P0713	Transmission Fluid Temperature Sensor Circuit High Input	Off	• DTC P0713 will be stored in TCM memory. • Freeze shift adapts. • Transmission default temperature calculated based on engine coolant temperature, manifold air temperature, and engine run time.
P0716	Automatic Transmission Input Speed Sensor Circuit Range/Performance	Flashing	• DTC P0716 will be stored in TCM memory. • Inhibit TCC engagement. • Freeze shift adapts. • Maximum line pressure.
P0717	Automatic Transmission Input Speed Sensor Circuit No Signal	Flashing	• DTC P0717 will be stored in TCM memory. • Inhibit TCC engagement. • Freeze shift adapts. • Maximum line pressure.
P0719	Brake Switch Circuit Low	Off	• DTC P0719 will be stored in TCM memory.
P0722	Automatic Transmission Output Speed Sensor (A/T OSS) Low Input	Flashing	• DTC P0722 will be stored in TCM memory. • Freeze shift adapts. • Maximum line pressure. • Output speed calculated from input speed, engine speed, and commanded gear.
P0723	Automatic Transmission Output Speed Sensor (A/T OSS) Intermittent	Flashing	• DTC P0723 will be stored in TCM memory. • Freeze shift adapts. • Commands maximum line pressure. • Output speed calculated from input speed, engine speed, and commanded gear.
P0724	Brake Switch Circuit High	Off	• DTC P0724 will be stored in TCM memory.
P0726	Engine Speed Sensor Circuit Intermittent	Flashing	• DTC P0726 will be stored in TCM memory. • Inhibit TCC engagement. • Freeze shift adapts.
P0727	Engine Speed Sensor Circuit Low Input	Flashing	• DTC P0727 will be stored in TCM memory. • Inhibit TCC engagement. • Freeze shift adapts. • Maximum line pressure.

Diagnostic Trouble Code (DTC) Identification (Cont'd)

DTC	Description	Power Lamp	Default Action
P0730	Incorrect Gear Ratio	Off	• DTC P0730 will be stored in TCM memory. • Maximum line pressure. • Freeze shift adapts.
P0741	Torque Converter Clutch Circuit Stuck Off	Flashing	• DTC P0741 will be stored in TCM memory. • Freeze shift adapts. • Inhibit TCC engagement.
P0742	Torque Converter Clutch Circuit Stuck On	Flashing	• DTC P0742 will be stored in TCM memory. • Freeze shift adapts. • TCC commanded for 1-2, 2-3 and 3-4 shifts.
P0748	Pressure Control Solenoid Circuit Electrical	Off	• DTC P0748 will be stored in TCM memory. • Freeze shift adapts. • Maximum line pressure.
P0751	1-2 Shift Solenoid Performance	Flashing	• DTC P0751 will be stored in TCM memory. • Freeze shift adapts. • Inhibit TCC engagement. • Maximum line pressure. • Commands soft landing to 2nd gear.
P0756	2-3 Shift Solenoid Performance	Flashing	• DTC P0756 will be stored in TCM memory. • Freeze shift adapts. • Inhibit TCC engagement. • Maximum line pressure. • Immediate landing to 2nd gear.
P1810	Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) Malfunction	Flashing	• DTC P1810 will be stored in TCM memory. • Freeze shift adapts. • Assume D4 shift pattern. • Inhibit TCC engagement. • Assume D2 braking pressure.
P1811	Maximum Adapt and Long Shift	Off	• DTC P1811 will be stored in TCM memory. • Maximum line pressure. • Freeze shift adapts.
P1814	Torque Converter Overstress	Off	• DTC P1814 will be stored in TCM memory.
P1887	TCC Release Switch Circuit Malfunction	Flashing	• DTC P1887 will be stored in TCM memory. • Freeze shift adapts. • Inhibit TCC engagement.



DIAGNOSTIC TROUBLE CODE (DTC) P0218 TRANSMISSION FLUID OVERTEMPERATURE

Circuit Description

The transmission fluid pump is constantly circulating fluid through the torque converter. Hot fluid leaving the converter flows through the transmission cooler lines to the oil cooler located in the vehicle radiator. From the cooler, fluid returns to the transmission.

Lube 1 fluid flows through the input shaft to lubricate transmission components in the front of the transmission. Lube 2 fluid circuit is fed by line pressure at the pressure regulator valve. This fluid flows through the oil feed pipes and into the forward clutch support. Lube 2 fluid provides lubrication to the rear components of the transmission.

When the TCM detects a high transmission fluid temperature for a long period of time, then DTC P0218 sets.

Conditions For Setting The DTC

- **Transmission temperature is greater than 130°C (260°F) for 15 minutes.**
- **No TFT Sensor DTC(s) P0711, P0712 or P0713.**

Action Taken When The DTC Sets

- **TCM will NOT flash the Power Lamp.**
- **Freeze shift adapts from being updated.**
- **DTC P0218 will be stored in TCM memory.**

Conditions For Clearing The DTC

- Transmission temperature is less than or equal to 129°C (260°F) for five seconds.
- History DTC(s) can be cleared by using a Scan Tool.
- Check the transmission cooling system.
- Question the owner for the possibility of vehicle overloading, exceeding trailer towing limits or towing in overdrive.

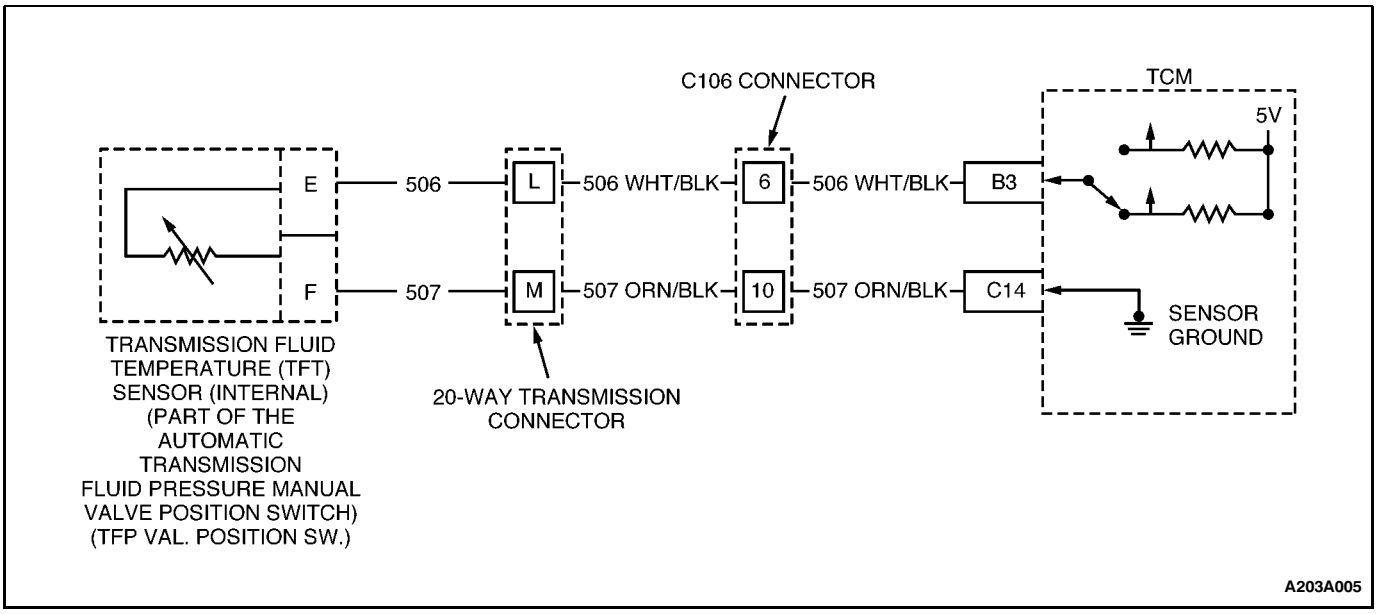
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. This step checks for possible low fluid level causing high transmission fluid temperatures.
2. This step checks for possible transmission cooling restrictions.
5. This step checks for possible torque converter failure.

DTC P0218 - Transmission Fluid Overtemperature

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). Has the transmission fluid checking procedure been performed? Refer to Transmission Fluid Checking Procedure.	-	Go to Step 2	Go to Fluid Checking Procedure
2	Inspect the engine and transmission cooling system for air flow restrictions or blockage, debris, or damaged cooler lines. Was the problem found and corrected?	-	Go to Step 6	Go to Step 3
3	Check the valve body for a stuck or leaking pressure regulator (PR) valve. Was the problem found and corrected?	-	Go to Step 6	Go to Step 4
4	Inspect the oil feed tubes for restrictions or leaking seals. Was the problem found and corrected?	-	Go to Step 6	Go to Step 5
5	Check for torque converter stator damage. Refer to Torque Converter Diagnosis. Was the problem found and corrected?	-	Go to Step 6	-
6	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0711 TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT RANGE/PERFORMANCE

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) sensor assembly is a thermistor and is part of the Automatic Transmission Fluid Pressure Manual Valve Position Switch Assembly (TFP Val. Position Sw.). The Transmission Control Module (TCM) supplies a 5-volt reference signal to the sensor on circuit 506. When transmission fluid is cold, the sensor resistance is high and the TCM senses a high signal voltage. As the transmission fluid warms, the sensor resistance lowers and the TCM senses lower voltage. The TCM uses the TFT readings to control Torque Converter Clutch (TCC) line pressure adjustments, and temperature compensated shifts.

When the TCM detects one of the following unusual conditions, then DTC P0711 sets.

1. **An unrealistically large change in transmission temperature.**
2. **A value which remains constant for a period of time in which a measurable amount of change is expected.**

Conditions For Setting The DTC

- **Engine is running.**
- **System voltage is between 9-16 volts.**
- **No VSS codes P0722 or P0723.**
- **No ISS codes P0716 or P0717.**
- **Vehicle speed is greater than 8 km/h (5 mph) for 409 seconds, cumulative.**
- **Transmission start up temperature is between * 40° and 21°C (* 40° and 69.8°F).**
- **TCC slip speed is greater than 300 rpm for 409 seconds, cumulative.**
- **Engine Coolant Temperature is greater than 70°C (158°F).**
- **Engine Coolant Temperature has changed by more than 50° since start up.**
- **All of the above must be true and one of the following fail cases must be true:**

Fail Case 1

- **Transmission temperature has not changed more than 1.5°C (2°F) since start-up.**

Fail Case 2

- **Transmission temperature changes more than 20°C (36°F) within 200 milliseconds.**

Action Taken When The DTC Sets

- **The TCM will flash the Power Lamp after two consecutive ignition cycles with a failure reported.**
- **DTC P0711 is stored in the TCM history.**
- **The TCM freezes shift adapts from being updated.**
- **The TCM calculates transmission temperature based on engine coolant temperature, intake manifold air temperature and engine run time.**

Conditions For Clearing The DTC

Fail Case 1

- **The TFT changes by more than 2.25 degrees for at least 5 seconds.**

Fail Case 2

- The TFT does not change by more than 20 degrees within 0.200 second for a period of at least 11 seconds.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wire that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

5. This step checks for an intermittent short or open condition in the engine wiring harness. The test light is used as a resistor in the circuit.
6. This step determines if the TCM or the TFT sensor is causing a steady, unchanging TFT reading.

DTC P0711 - Transmission Fluid Temperature (TFT) Sensor Circuit Range/Performance

Step	Action	Value(s)	Yes	No
1	Perform the transmission fluid checking procedure. Refer to Transmission Fluid Checking Procedure. Did you perform the fluid checking procedure?	-	Go to Step 2	Go to Transmission Fluid Checking Procedure
2	1. Install the scan tool. 2. With the engine OFF, turn the ignition switch to the ON position. 3. Record then clear DTC(s). 4. Select TFT on the scan tool. 5. Drive the vehicle and observe the scan tool for either of the following conditions: • The TFT does not change more than 1.5°C (2.7°F) in 80 seconds since start-up. • The TFT changes more than 20°C (36°F) in 0.200 seconds 14 times within 7 seconds (unrealistic change). Did either of the fail conditions occur?	-	Go to Step 3	Go to Diagnostic Aids
3	Did the scan tool display a condition in which the TFT does not change by more than the specified value in 80 seconds since start-up?	1.5°C (2.7°F)	Go to Step 5	Go to Step 4
4	1. Turn the engine OFF. 2 Disconnect the transmission 20-way connector. 3. Install the J 39775 Jumper Harness on the engine side of the 20-way connector. 4. Using the J 35616 Connector Test Adapter Kit, connect a test light from terminal L to terminal M. 5. Turn the ignition switch to the ON position. 6. While observing the scan tool display, move or massage the engine wiring harness from the TCM connectors to the transmission 20-way connector. Does the TFT change by more than the specified value?	20°C (36°F)	Go to Step 6	Go to Step 7
5	1. Turn the ignition OFF. 2 Disconnect the transmission 20-way connector. 3. Turn the ignition switch to the ON position. Did the scan tool display a condition in which the TFT does not change by more than the specified value in 80 seconds since start-up?	1.5°C (2.7°F)	Go to Step 10	Go to Step 9

DTC P0711 - Transmission Fluid Temperature (TFT) Sensor Circuit Range/Performance (Cont'd)

Step	Action	Value(s)	Yes	No
6	Inspect circuits 506 and 507 of the engine wiring harness for an intermittent open or short condition. Repair the circuits if necessary. Was a problem found?	-	Go to Step 11	Go to Step 10
7	Inspect the automatic transmission wiring harness for an intermittent short to ground or a short together on circuits 506 or 507. Was a problem found?	-	Go to Step 8	Go to Step 9
8	Replace the automatic transmission wiring harness. Is the replacement complete?	-	Go to Step 11	-
9	Replace the TFT sensor (this is part of the TFP Valve Position Switch). Is the replacement complete?	-	Go to Step 11	-
10	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 11	-
11	1. After the repair, use a scan tool "Clear Info" function and road test the vehicle. 2 Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

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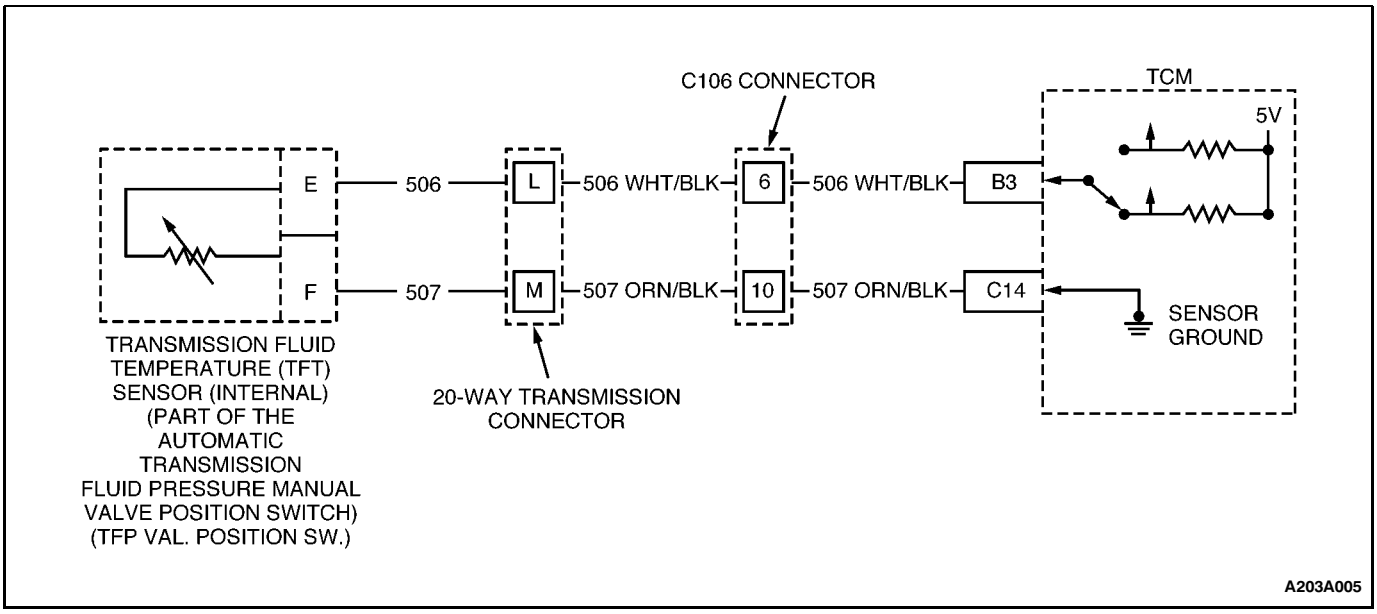


DIAGNOSTIC TROUBLE CODE (DTC) P0712
TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT LOW INPUT

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) sensor assembly is a thermistor and is part of the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.). The TCM supplies a 5 volt reference signal to the sensor on circuit 506. When transmission fluid is cold, the sensor resistance is high and the TCM will sense a high signal voltage. As the transmission fluid warms, the sensor resistance lowers and the TCM senses lower voltage. The TCM uses the TFT readings to control Torque Converter Clutch (TCC) apply and release, line pressure adjustments, and temperature compensated shifts.

When the TCM detects a continuous short to ground in the TFT signal circuit or the TFT sensor, then DTC P0712 sets.

Conditions For Setting The DTC

- **Ignition is ON.**
- **TFT voltage is less then 0.33 volts for 10 seconds.**

Action Taken When The DTC Sets

- **Freeze shift adapts from being updated.**
- **Transmission default temperature will be calculated based on engine coolant temperature, manifold air temperature, and engine run time.**
- **DTC P0712 will be stored in TCM memory.**

Conditions For Clearing The DTC

- **When TFT voltage is greater than 0.33 volts for 10 seconds for three consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a Scan Tool.**

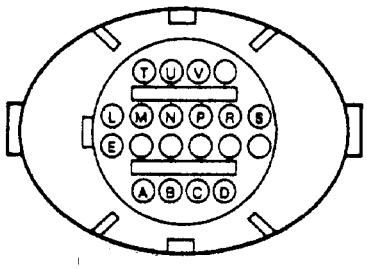
Diagnostic Aids

- **Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**
- **DTC P0712 could set if the vehicle or transmission has been exposed to temperature above 150° C (300° F).**

Test Description

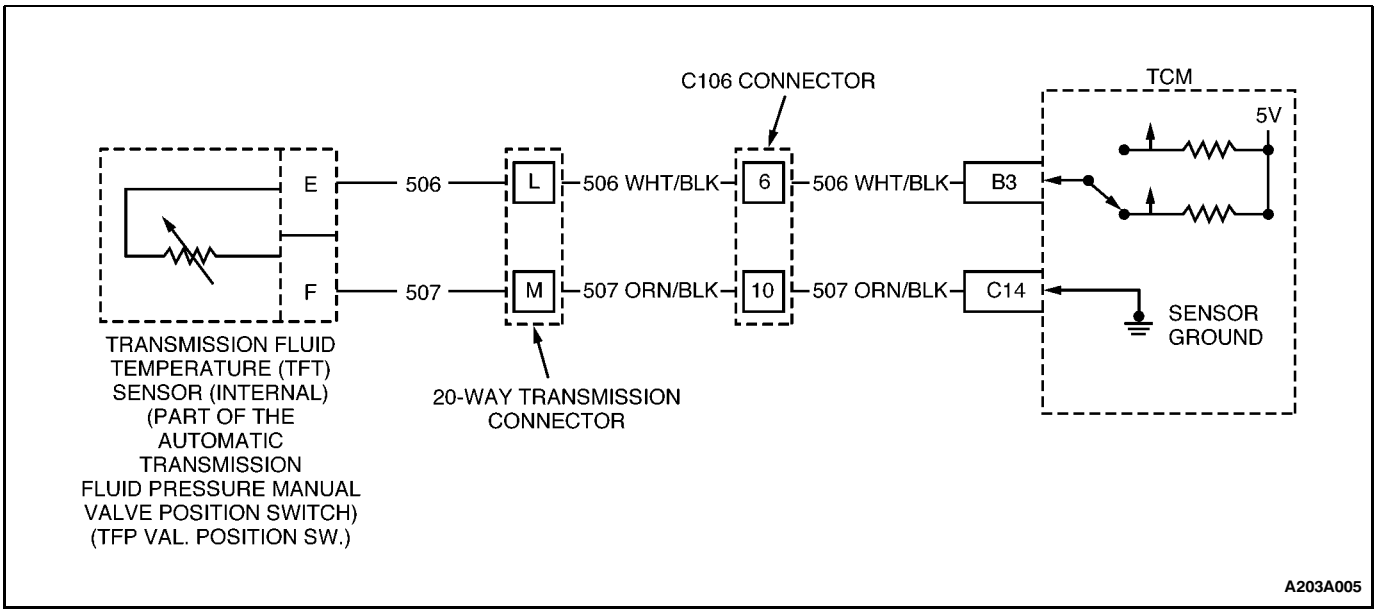
The numbers below refer to the step numbers on the diagnostic chart.

2. **This test checks the TCM's ability to detect an open circuit.**
3. **This test checks the TFT Sensor for correct resistance.**



DTC P0712 - Transmission Fluid Temperature (TFT) Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). 4. Select Scan Tool Data List Trans Fluid Temp Sensor. Does the scan tool display transmission fluid temperature as shown?	152°C	Go to Step 2	Go to Diagnostic Aids
2	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Ignition ON. Does the scan tool display transmission fluid temperature as shown?	* 40°C	Go to Step 4	Go to Step 3
3	Check circuit 506 from the engine side of the transmission 20-way connector to the TCM connector for a short to ground. Was the problem found and corrected?	-	Go to Step 8	Go to Step 5
4	Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal L to terminal M. (Refer to Transmission Connector End View.) Are ohm readings within range shown for the given transmission temperature range?	20°C (68°F) 3106-3923W 100°C (212°F) 164-190W	Go to Step 5	Go to Step 6
5	Replace the TCM. Is the replacement complete?	-	Go to Step 8	-
6	Check circuit 506 from the transmission 20-way connector to the TFT sensor connector for a short to ground. Was the problem found and corrected?	-	Go to Step 8	Go to Step 7
7	Replace the TFP Val. Position Sw. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Replacement. Is the replacement complete?	-	Go to Step 8	-
8	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0713
TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR CIRCUIT HIGH INPUT

Circuit Description

The Automatic Transmission Fluid Temperature (TFT) Sensor Assembly is a thermistor and is part of the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.). The TCM supplies a 5 volt reference signal to the sensor on circuit 506. When transmission fluid is cold, the sensor resistance is high and the TCM will sense a high signal voltage. As the transmission fluid warms, the sensor resistance lowers and the TCM senses lower voltage. The TCM uses the TFT readings to control Torque Converter Clutch (TCC) apply and release, line pressure adjustments, and temperature compensated shifts.

When the TCM detects a continuous open or short to power in the TFT signal circuit or the TFT sensor, then DTC P0713 sets.

Conditions For Setting The DTC

- **Ignition is ON.**
- **TFT voltage is greater than 4.92 volts for 30 seconds.**

Action Taken When The DTC Sets

- **DTC P0713 will be stored in TCM memory.**
- **Freeze shift adapts from being updated.**
- **Transmission default temperature will be calculated based on engine coolant temperature, manifold air temperature, and engine run time.**

Conditions For Clearing The DTC

- **When the TFT voltage is less than 4.92 volts for 30 seconds for three consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a Scan Tool.**

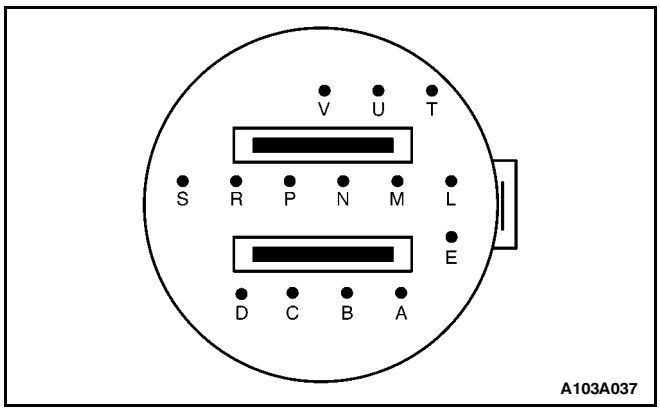
Diagnostic Aids

- **Inspect the wiring for poor electrical connection at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**

Test Description

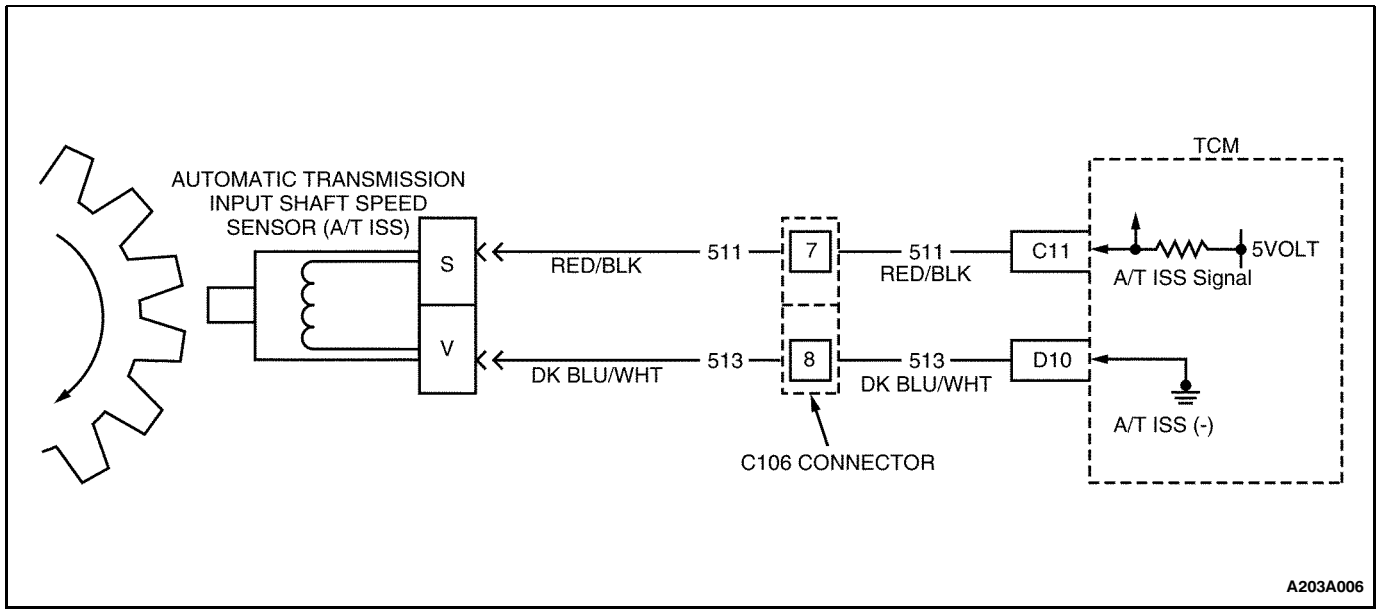
The numbers below refer to the step numbers on the diagnostic chart.

2. **This test checks the wiring from the transmission 20-way connector to the TCM for an open or short.**
3. **This test checks circuit 507 from the TCM to the transmission connector.**



DTC P0713 - Transmission Fluid Temperature (TFT) Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). 4. Select Scan Tool Data List Trans Fluid Temp Sensor. Does the scan tool display transmission fluid temperature as shown?	* 40°C	Go to Step 2	Go to Diagnostic Aids
2	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Using J 35616 Connector Test Adapter Kit, install a fused jumper wire from terminal L to terminal M. 4. Ignition ON, engine OFF. Does the scan tool display transmission fluid temperature as shown?	152°C	Go to Step 6	Go to Step 3
3	Using J 35616 Connector Test Adapter Kit, jump terminal L to a good ground. Does the scan tool display transmission fluid temperature as shown?	152°C	Go to Step 6	Go to Step 4
4	Check circuit 506 from the engine side of the transmission 20-way connector to connector for an open. Was the problem found and corrected?	-	Go to Step 8	Go to Step 5
5	Replace the TCM. Is the replacement complete?	-	Go to Step 8	-
6	Check circuit 506 and circuit 507 from the transmission 20-way connector to the TFT sensor for an open. Was the problem found and corrected?	-	Go to Step 8	Go to Step 7
7	Replace the TFP Val. Position Sw. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Replacement. Is the replacement complete?	-	Go to Step 8	-
8	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0716
INPUT SPEED SENSOR CIRCUIT RANGE/PERFORMANCE

Circuit Description

Transmission input speed is provided to the Transmission Control Module (TCM) by the Automatic Transmission Input (Shaft) Speed Sensor (A/T ISS), which is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the drive sprocket. The PM generator produces an AC voltage as the drive sprocket rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the turbine shaft increases. The TCM then converts the AC voltage into a digital signal. This digital signal is then used by the TCM to determine actual turbine speed. The TCM uses input speed to calculate torque converter slip speed and gear ratios.

When the TCM detects an unrealistic large change in input speed, then DTC P0716 sets.

Conditions For Setting The DTC

- **Input speed change is greater than 1300 rpm in 0.8 seconds.**
- **No Input Speed Sensor DTC P0717.**
- **No TPS DTC P1791.**
- **No VSS DTC(s) P0722 or P0723.**
- **No 1-2 shift solenoid DTC P0751.**
- **Engine running.**
- **TP angle is greater then 15%.**
- **Vehicle speed is greater than 8 km/h (5 mph).**

Action Taken When The DTC Sets

- **DTC P0716 will be stored in TCM memory.**
- **TCM inhibits TCC engagement.**
- **Freeze shift adapts from being updated.**
- **TCM commands maximum line pressure.**

Conditions For Clearing The DTC

- **Input speed is greater than 50 rpm.**
- **When the input speed has changed less than 300 rpm in 0.3 seconds for three consecutive ignition cycles.**
- **No Input Speed Sensor DTC P0717.**
- **History DTC(s) can be cleared by using a Scan Tool.**

Diagnostic Aids

- **This diagnostic test checks for an input speed sensor circuit problem. If the engine is running and the vehicle is moving above a certain speed, then the input speed must be non-zero.**
- **Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**

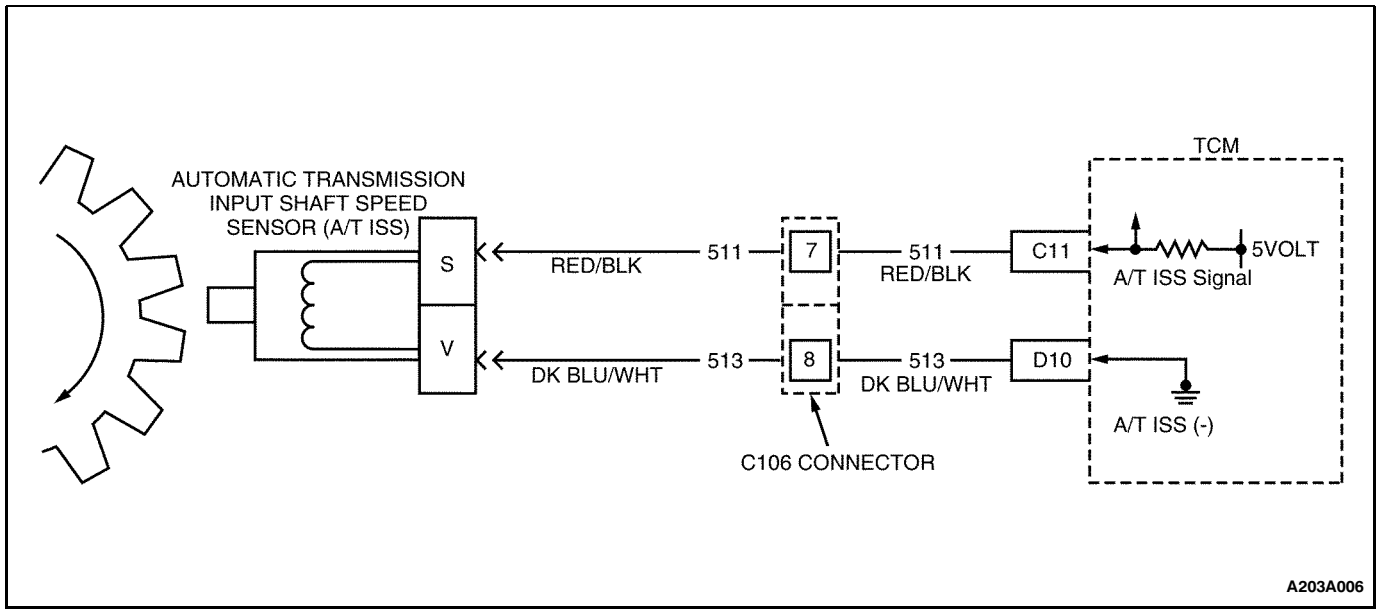
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

2. **This test checks the input speed sensor for correct resistance.**
6. **This test verifies the wiring from the transmission 20-way connector to the TCM, and tests the ability of the A/T ISS to produce an AC current.**

DTC P0716 - Input Speed Sensor Circuit Range/Performance

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Turn the ignition switch to the ON position. 3. Engine not running. 4. Record then clear the DTC(s). 5. Start the engine. 6. Select scan tool Trans ISS. Does the scan tool display transmission input speed more than shown?	500 rpm	Go to Diagnostic Aids	Go to Step 2
2	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Install J 39775 Jumper Harness to the transmission 20-way connector. 4. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter between terminals S and V. Does the ohmmeter display resistance as shown?	615-835W	Go to Step 6	Go to Step 3
3	Check circuit 511 from the transmission 20-way connector to the A/T ISS for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 4
4	Check circuit 513 from the transmission 20-way connector to the A/T ISS for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 5
5	Replace the A/T ISS. Refer to Automatic Transmission Input (Shaft) Speed Sensor Replacement. Is the replacement complete?	-	Go to Step 10	-
6	1. Ignition OFF. 2. Disconnect J 39775 Jumper Harness and reconnect the 20-way connector. 3. Disconnect the TCM connector. 4. Using J 35616 Connector Test Adapter Kit, connect a voltmeter from terminals C11 to terminal D10. 5. Select the A/C volts. 6. Crank the engine. Does the voltmeter display volts greater than shown?	0.150 mV (50 Hz)	Go to Step 9	Go to Step 7
7	Check circuit 511 from the engine 20-way connector to the TCM connector for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 8
8	Check circuit 513 from the engine 20-way connector to the TCM connector for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	-
9	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 10	-
10	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0717
INPUT SPEED SENSOR CIRCUIT NO SIGNAL

Circuit Description

Transmission input speed is provided to the Transmission Control Module (TCM) by the Automatic Transmission Input (Shaft) Speed Sensor (A/T ISS), which is a Permanent Magnet (PM) generator. The sensor mounts into the transmission case and maintains a slight air gap between the sensor and the drive sprocket. The PM generator produces an AC voltage as the drive sprocket rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the turbine shaft increases. The TCM then converts the AC voltage into a digital signal. This digital signal is then used by the TCM to determine actual turbine speed. The TCM uses input speed to calculate torque converter slip speed and gear ratios.

When the TCM detects a low input speed when the vehicle has a large output speed, then DTC P0717 sets.

Conditions For Setting The DTC

- **No TFP Val. Position Sw. DTC P1810.**
- **No VSS DTC(s) P0722 or P0723.**
- **Engine running.**
- **TFP Val. Position Sw. is indicating transmission is not in Park or Neutral.**
- **Turbine input speed is less than 100 rpm for five seconds.**
- **Vehicle speed is greater than 8 km/h (5 mph).**

Action Taken When The DTC Sets

- **DTC P0717 will be stored in TCM memory.**
- **TCM commands maximum line pressure.**
- **TCM inhibits TCC engagement.**
- **Freeze shift adapts from being updated.**

Conditions For Clearing The DTC

- **When turbine speed is greater than 120 rpm for three seconds for three consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a Scan Tool.**

Diagnostic Aids

- **This diagnostic test checks for an input speed sensor circuit problem. If the engine is running and the vehicle is moving above a certain speed, then the input speed must be non-zero.**
- **Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**

Test Description

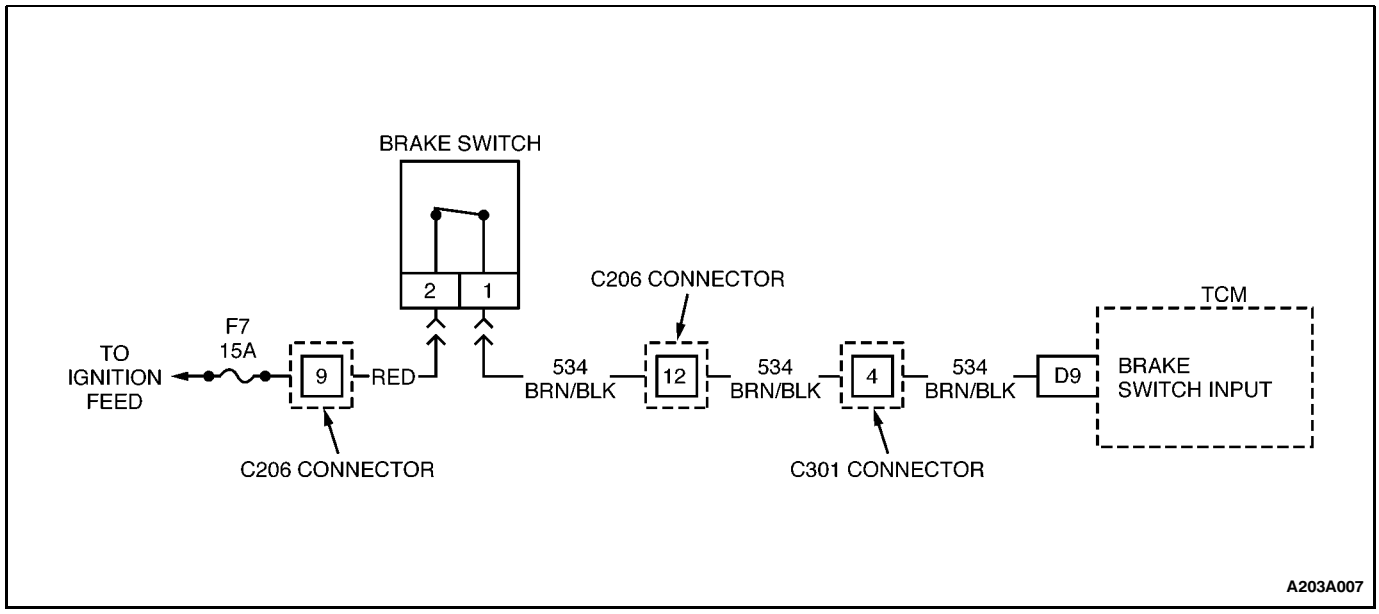
The numbers below refer to the step numbers on the diagnostic chart.

2. This test checks the input speed sensor for correct resistance.

6. This test verifies the wiring from the transmission 20-way connector to the TCM, and tests the ability of the A/T ISS to produce an AC current.

DTC P0717 - Input Speed Sensor Circuit No Signal

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Turn the ignition switch to the ON position. 3. Engine not running. 4. Record then clear the DTC(s). 5. Start the engine. 6. Select scan tool Trans ISS. Does the scan tool display transmission input speed more than shown?	500 rpm	Go to Diagnostic Aids	Go to Step 2
2	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Install J 39775 Jumper Harness to the transmission 20-way connector. 4. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter between terminals S and V. Does the ohmmeter display resistance as shown?	615-835W	Go to Step 6	Go to Step 3
3	Check circuit 511 from the transmission 20-way connector to the A/T ISS for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 4
4	Check circuit 513 from the transmission 20-way connector to the A/T ISS for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 5
5	Replace the A/T ISS. Refer to Automatic Transmission Input (Shaft) Speed Sensor Replacement. Is the replacement complete?	-	Go to Step 10	-
6	1. Ignition OFF. 2. Disconnect J 39775 Jumper Harness and reconnect the 20-way connector. 3. Disconnect the TCM connector. 4. Using J 35616 Connector Test Adapter Kit, connect a voltmeter from terminals C11 to terminal D10. 5. Select the A/C volts. 6. Crank the engine. Does the voltmeter display volts greater than shown?	0.150 mV (50 Hz)	Go to Step 9	Go to Step 7
7	Check circuit 511 from the engine 20-way connector to the TCM connector for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 8
8	Check circuit 513 from the engine 20-way connector to the TCM connector for an open or short to ground. Was the condition found and corrected?	-	Go to Step 10	Go to Step 9
9	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 10	-
10	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0719
BRAKE SWITCH CIRCUIT LOW

Circuit Description

The brake switch is used to indicate brake pedal status to the Transmission Control Module (TCM). The brake switch is a normally-open switch. Applying the brake pedal closes the switch, supplying voltage to the TCM. Releasing the brake pedal interrupts voltage to the TCM. When the TCM sees 12 volts at the brake switch input, the TCM de-energizes the Torque Converter Clutch Solenoid Valve (TCC Sol. Val.).

When the TCM detects an open brake switch during decelerations, then DTC P0719 sets.

Conditions For Setting The DTC

This DTC will set if the TCM detects an open brake switch/circuit (0 volts) during vehicle deceleration and the following conditions occur six consecutive times:

- Vehicle speed is greater than 32 km/h for six seconds; then vehicle speed is between 8 and 32 km/h for four seconds; then vehicle speed is less than 8 km/h.

Action Taken When The DTC Sets

- DTC P0719 will be stored in TCM memory.

Conditions For Clearing The DTC

- When the TCM has seen a change in the brake switch state and three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Ask customer about driving habits and/or unusual traffic conditions, such as heavy stop and go driving.
- Check brake switch for proper adjustment.
- Inspect the wiring for poor electrical connections at the TCM and at the brake switch connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

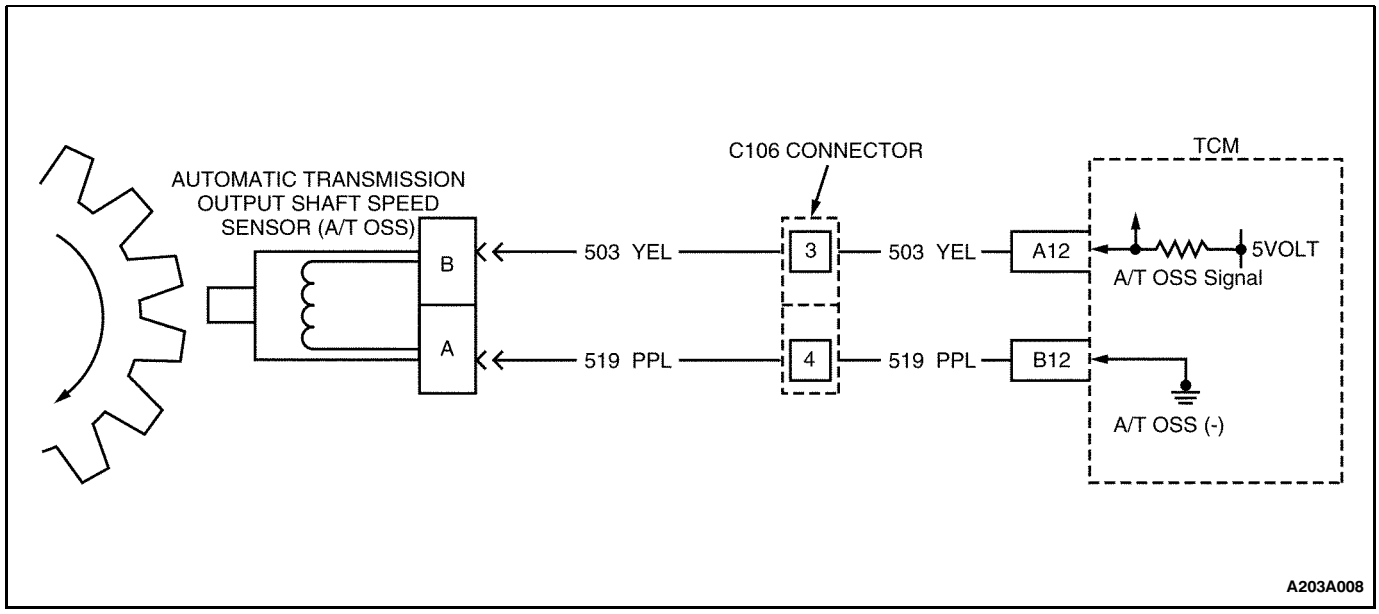
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. Disconnecting the brake switch connector, and jumping the circuit, and observing a status change, isolates the brake switch as the source for setting the DTC.
2. If the brake switch circuit is shorted to ground, the ignition feed fuse would open.
4. If the brake switch is adjusted properly, then the brake switch must be replaced.
7. Replacement of the TCM only after the brake switch and all related circuitry have been properly inspected or repaired.

DTC P0719 - Brake Switch Circuit Low

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Turn the ignition switch to the ON position. 3. Engine not running. 4. Record then clear the DTC(s). 5. Select scan tool Brake Switch. 6. Disconnect the brake switch connector. 7. Install a fuse jumper from terminal 1 to terminal 2 of the brake switch connector. Did the brake switch status change from “Open” to “Close”?	-	Go to Step 4	Go to Step 2
2	Remove and inspect the brake switch ignition feed fuse for an open. Was the fuse open?	-	Go to Step 3	Go to Step 6
3	Inspect the brake switch feed circuit for a short to ground. Was the condition found and corrected?	-	Go to Step 8	-
4	Inspect the brake switch for proper adjustment. Was the condition found and corrected?	-	Go to Step 8	Go to Step 5
5	Replace the brake switch. Refer to Brake Switch Replacement. Is the replacement complete?	-	Go to Step 8	-
6	Inspect circuit 534 for an open. Was the condition found and corrected?	-	Go to Step 8	Go to Step 7
7	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 8	-
8	1. After the repair is complete, select scan tool “Clear Info” function and road test the vehicle. 2. Review the “DTC Info”. Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0722
AUTOMATIC TRANSMISSION OUTPUT SPEED SENSOR (A/T OSS) LOW INPUT

Circuit Description

Vehicle speed is provided to the Transmission Control Module (TCM) by the Automatic Transmission Output (Shaft) Speed Sensor (A/T OSS), which is a Permanent Magnet (PM) generator mounted to the transmission case. The PM generator produces an AC voltage as the speed sensor rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the vehicle increases. The TCM then converts the AC voltage into a digital signal. The TCM uses the vehicle speed to determine shift timing, TCC apply, TCC release, and gear ratio calculations.

When the TCM detects a low vehicle output speed when the vehicle has a large engine speed in a drive gear, then DTC P0722 sets.

Conditions For Setting DTC

- Transmission not in P (Park) or N (Neutral).
- No MAP DTC.
- No A/T ISS DTC(s) P0716 or P0717.
- No TP DTC P1791.
- No TFP Val. Position Sw. DTC P1810.
- TP is greater than 10%.
- MAP is greater than 10 kPa.
- Transmission input speed is greater than 1000 rpm.
- Engine speed is greater than 6000 rpm.
- Output speed is less than 100 rpm.
- All the above conditions are met for five seconds.

Action Taken When The DTC Sets

- TCM will flash the Power Lamp after two consecutive trips with a failure reported.
- TCM freezes shift adapts from being updated.
- TCM commands maximum line pressure.
- TCM calculates output speed based on input speed, engine speed, and commanded gear.
- DTC P0722 will be stored in TCM memory.

Conditions For Clearing The DTC

- The TCM will turn the Power Lamp off after the transmission output speed is greater than 500 rpm for three seconds and three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Condition may be intermittent. Check for loose output speed sensor mounting or poor sensor connection.
- Inspect for a damaged output speed sensor or transmission rotor teeth.
- Inspect the wiring for poor electrical connections at the TCM and at the A/T OSS. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

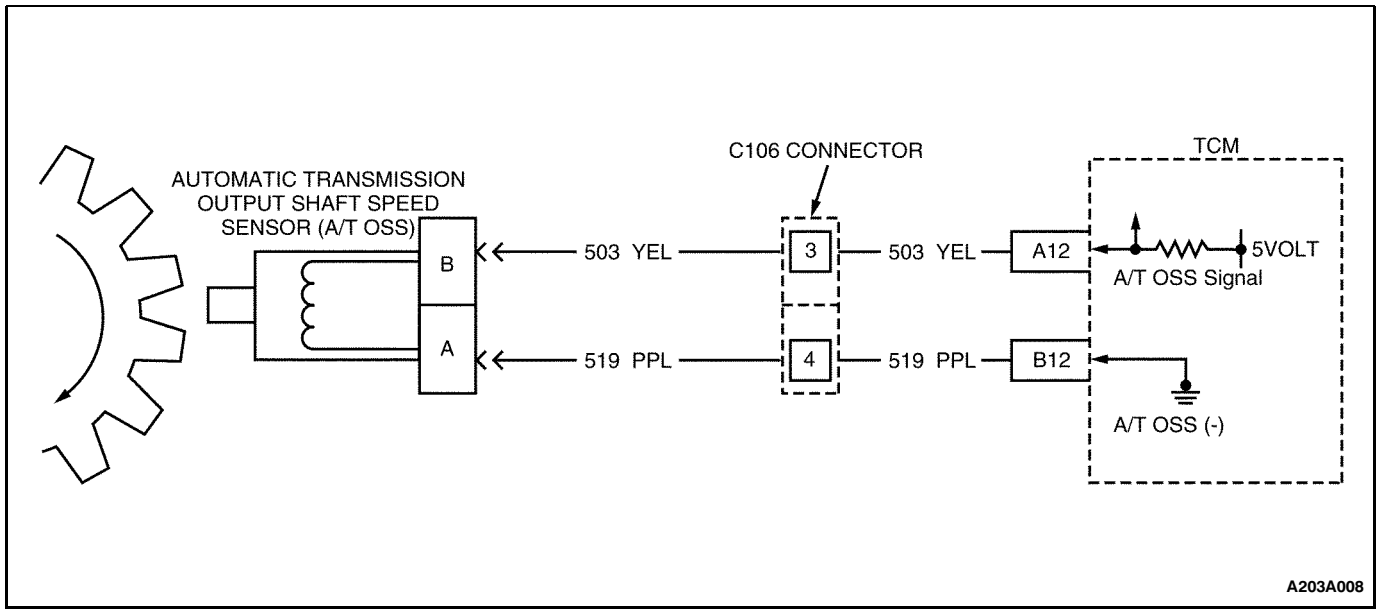
Test Description

The numbers below refer to the numbered steps on the diagnostic chart.

2. This test checks the A/T OSS for correct resistance.
3. This tests the A/T OSS ability to produce an AC current and the integrity of the wiring to the TCM.

DTC P0722 - Automatic Transmission Output Speed Sensor (A/T OSS) Low Input

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. With the engine OFF, turn the ignition switch to the ON position. 3. Record then clear the DTC(s). Notice: In order to avoid damage to the drive axles, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel. 4. Raise and support the drive wheels. 5. Start and idle the engine. 6. Place the transmission in Drive. With the drive wheels rotating, does the transmission output speed increase when the wheel speed increases?	-	Go to Diagnostic Aids	Go to Step 2
2	1. Turn the ignition OFF. 2. Disconnect the A/T OSS connector at the transmission. 3. Using J 35616 Connector Test Adapter Kit, connect the ohmmeter from terminal A to terminal B of the A/T OSS. Is the resistance within the specified range?	1530-1870W	Go to Step 3	Go to Step 5
3	1. Reconnect the A/T OSS connector. 2. Disconnect the TCM connector. 3. Connect a voltmeter between terminals A12 and B12. 4. Select the AC volts. 5. Rotate the drive wheels. 6. Observe the voltmeter display. Is the voltage greater than the specified value?	0.5 V	Go to Step 6	Go to Step 4
4	Inspect circuits 503 and 519 for an open, short to ground, or short together. Refer to Troubleshooting Procedures. Was the condition found and corrected?	-	Go to Step 7	Go to Diagnostic Aids
5	Replace the A/T OSS. Refer to Sensor Replacement. Is the replacement complete?	-	Go to Step 7	-
6	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 7	-
7	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0723 AUTOMATIC TRANSMISSION OUTPUT SPEED SENSOR (A/T OSS) INTERMITTENT

Circuit Description

Vehicle speed is provided to the Transmission Control Module (TCM) by the Automatic Transmission Output (Shaft) Speed Sensor (A/T OSS), which is a Permanent Magnet (PM) generator mounted to the transmission case. The PM generator produces an AC voltage as the speed sensor rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the vehicle increases. The TCM then converts the AC voltage into a digital signal. The TCM uses the vehicle speed to determine shift timing, TCC apply, TCC release, and gear ratio calculations.

When the TCM detects an unrealistic large change in vehicle speed, then DTC P0723 sets.

Conditions For Setting The DTC

- **Engine running.**
- **No TFP Val. Position Sw. DTC P1810.**
- **Time since last manual gear select lever change is greater than 3 seconds.**
- **A decrease in output speed greater than 900 rpm in park or neutral or a decrease greater than 1300 rpm in drive.**

Action Taken When The DTC Sets

- **TCM will flash the Power Lamp after two consecutive trips with a failure reported.**
- **TCM freezes shift adapts from being updated.**
- **TCM commands maximum line pressure.**
- **The TCM calculates ouput speed based on input speed, engine speed, and commanded gear.**
- **DTC P0723 will be stored in TCM memory.**

Conditions For Clearing The DTC

- **The TCM will turn the Power Lamp off after the output speed sensor has not failed this DTC for three consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a Scan Tool.**

Diagnostic Aids

- **Condition may be intermittent. Check for loose output speed sensor mounting or poor sensor connection.**
- **Inspect for a damaged output speed sensor or transmission rotor teeth.**
- **Inspect the wiring for poor electrical connections at the TCM and at the A/T OSS. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**

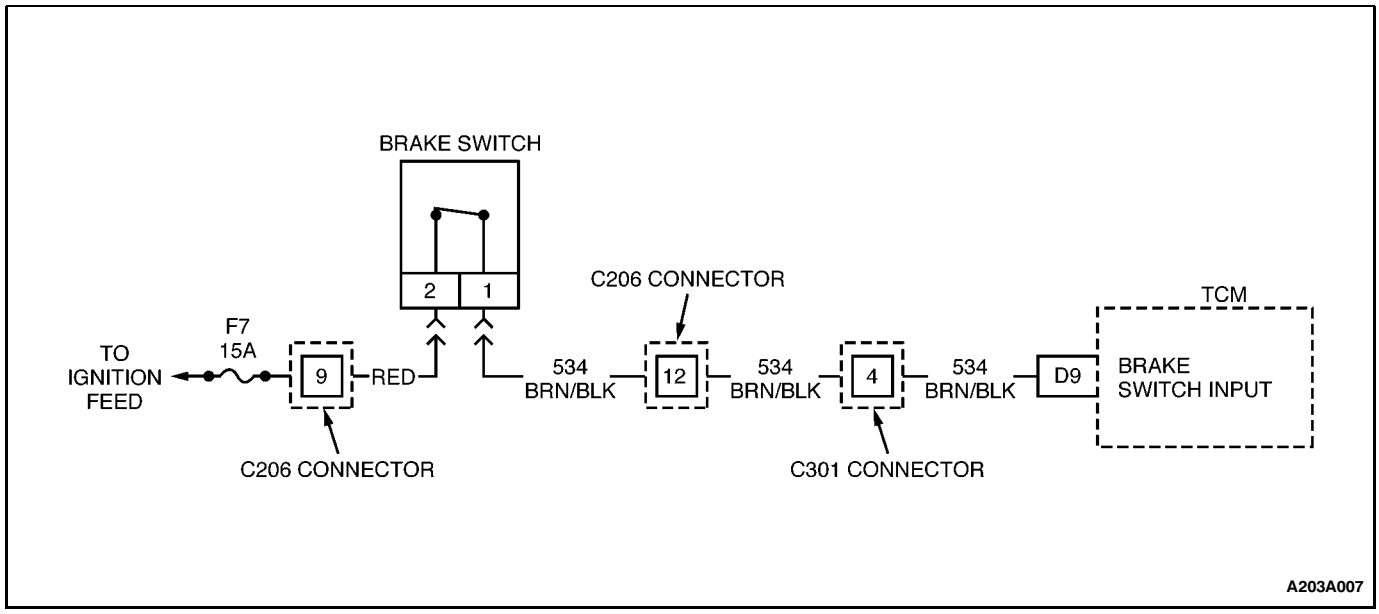
Chart Test Description

The numbers below refer to the numbered steps on the diagnostic chart.

2. **This test checks the A/T OSS for correct resistance.**
3. **This tests the A/T OSS ability to produce an AC current and the integrity of the wiring to the TCM.**

DTC P0723 - Automatic Transmission Output Speed Sensor (A/T OSS) Intermittent

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. With the engine OFF, turn the ignition switch to the ON position. 3. Record then clear the DTC(s). Notice: In order to avoid damage to the drive axles, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel. 4. Raise and support the drive wheels. 5. Start and idle the engine. 6. Place the transmission in Drive. With the drive wheels rotating, does the transmission output speed increase when the wheel speed increases?	-	Go to Diagnostic Aids	Go to Step 2
2	1. Turn the ignition OFF. 2. Disconnect the A/T OSS connector at the transmission. 3. Using J 35616 Connector Test Adapter Kit, connect the ohmmeter from terminal A to terminal B of the A/T OSS. Is the resistance within the specified range?	1530-1870W	Go to Step 3	Go to Step 5
3	1. Reconnect the A/T OSS connector. 2. Disconnect the TCM connector. 3. Connect a voltmeter between terminals A12 and B12. 4. Select the AC volts. 5. Rotate the drive wheels. 6. Observe the voltmeter display. Is the voltage greater than the specified value?	0.5 V	Go to Step 6	Go to Step 4
4	Inspect circuits 503 and 519 for an open, short to ground, or short together. Refer to Troubleshooting Procedures. Was the condition found and corrected?	-	Go to Step 7	Go to Diagnostic Aids
5	Replace the A/T OSS. Refer to Sensor Replacement. Is the replacement complete?	-	Go to Step 7	-
6	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 7	-
7	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0724
BRAKE SWITCH CIRCUIT HIGH

Circuit Description

The brake switch is used to indicate brake pedal status to the Transmission Control Module (TCM). The brake switch is a normally-open switch. Applying the brake pedal closes the switch, supplying voltage to the TCM. Releasing the brake pedal interrupts voltage to the TCM. When the TCM sees 12 volts at the brake switch input, the TCM de-energizes the Torque Converter Clutch Solenoid Valve (TCC Sol. Val.).

When the TCM detects a closed brake switch during accelerations, then DTC P0724 sets.

Conditions For Setting The DTC

This DTC will set if the TCM detects a closed brake switch/circuit (12 volts) during vehicle acceleration and the following conditions occur six consecutive times:

- Vehicle speed is less than 8 km/h; then vehicle speed is between 8 and 32 km/h for four seconds; then vehicle speed is greater than 32 km/h for six seconds.

Action Taken When The DTC Sets

- DTC P0724 will be stored in TCM memory.

Conditions For Clearing The DTC

- When the TCM has seen a change in the brake switch state and three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Ask customer about driving habits and/or unusual traffic conditions, such as heavy stop and go driving.
- Check brake switch for proper adjustment.
- Inspect the wiring for poor electrical connections at the TCM and at the brake switch. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

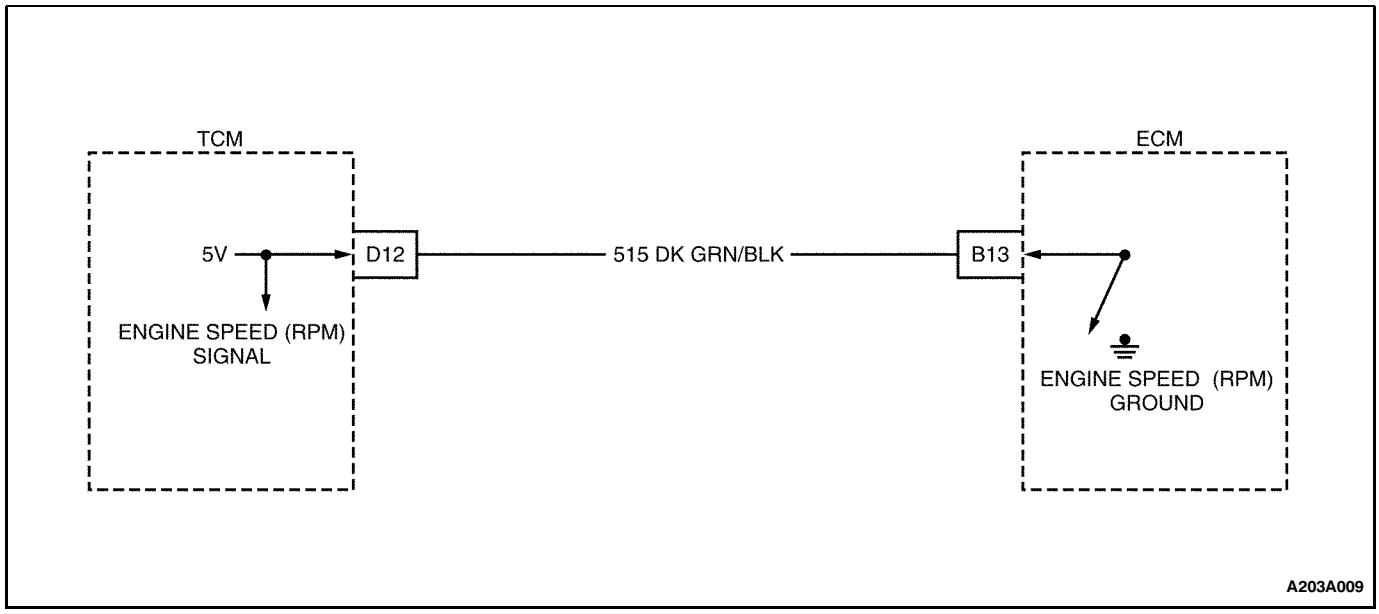
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. Disconnecting the brake switch connector, and observing a status change, isolates the brake switch as the source for setting the DTC.
2. If the brake switch is adjusted properly, then the brake switch must be replaced.
3. This step will inspect circuit 534 for a short to power if the status on the scan tool never changed from "Closed" to "Open." If a short is found, make the appropriate repair.
4. Replacement of the TCM only after the brake switch and all related circuitry have been properly inspected or repaired.

DTC P0724 - Brake Switch Circuit High

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Turn the ignition switch to the ON position. 3. Engine not running. 4. Record then clear the DTC(s). 5. Select scan tool Brake Switch. 6. Disconnect the brake switch connector. Did the brake switch status change from “Closed” to “Open”?	-	Go to Step 2	Go to Step 3
2	Replace the brake switch. Refer to Brake Switch Replacement. Is the replacement complete?	-	Go to Step 5	-
3	Inspect circuit 534 for being short to power. Was the condition found and corrected?	-	Go to Step 5	Go to Step 4
4	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 5	-
5	1. After the repair is complete, select scan tool “Clear Info” function and road test the vehicle. 2. Review the “DTC Info”. Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0726 ENGINE SPEED SENSOR CIRCUIT INTERMITTENT

Circuit Description

The ECM receives a signal from the ignition system to determine engine speed. The TCM sends five volts on circuit 515 to the ECM. The ECM pulses this circuit to ground at the rate of 33 Hz per 1000 rpm. The TCM uses the rpm signal to calculate torque converter slip and TCC apply rate.

When the TCM detects a loss of engine input speed, then DTC P0726 sets.

Conditions For Setting The DTC

- Engine is running.
- Engine speed is greater than 250 rpm.
- Engine rpm changes more than 1000 rpm within one second.

Action Taken When The DTC Sets

- TCM inhibits TCC engagement.
- TCM freezes shift adapts from being updated.
- The TCM will flash the Power Lamp.

Conditions For Clearing The DTC

- The TCM will turn the Power Lamp off after the engine speed is greater than 200 rpm for one second.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and at the ECM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wires inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

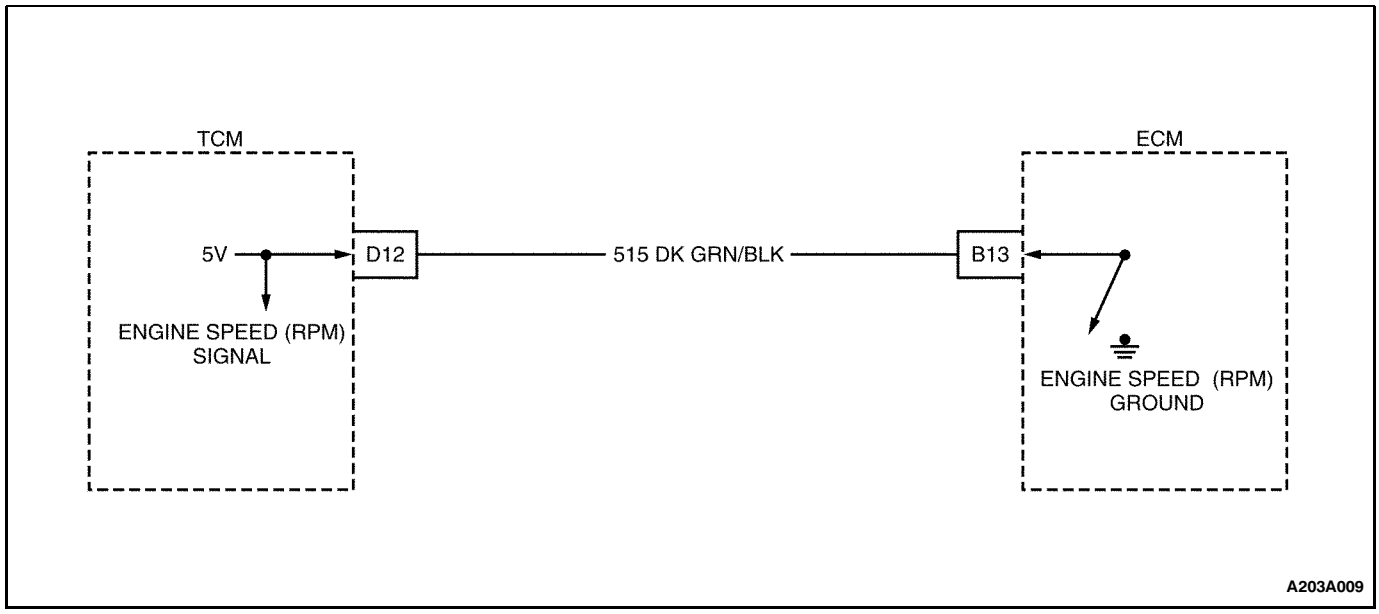
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. This step checks for a five volt signal from the TCM.
2. This step checks for a short to power (12V) on circuit 515.
4. This step checks for a short to power (12V) on circuit 515.

DTC P0726 - Engine Speed Sensor Circuit Intermittent

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear the DTC(s). 4. Ignition OFF. 5. Disconnect the ECM connector. 6. Ignition ON. 7. Set voltmeter to DC volts. 8. Connect a voltmeter from terminal B13 of the ECM connector to a good ground. Is voltage reading as shown?	5.0 V	Go to Step 2	Go to Step 5
2	Is voltage greater than shown?	u 5.0 V	Go to Step 3	Go to Step 7
3	1. Connect a test light from terminal B13 of the ECM connector to a good ground. 2. Disconnect the TCM connector. Is the test light ON?	-	Go to Step 4	-
4	Check circuit 515 for a short to power. Was the condition found and corrected?	-	Go to Step 8	-
5	Check circuit 515 from the TCM to ECM connector terminal B13 for an open or short to ground. Was the condition found and corrected?	-	Go to Step 8	Go to Step 6
6	Replace the TCM. Is the replacement complete?	-	Go to Step 8	-
7	Replace the ECM. Is the replacement complete?	-	Go to Step 8	-
8	1. After the repair is complete, select scan tool “Clear Info” function and road test the vehicle. 2. Review the “DTC Info”. Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0727 ENGINE SPEED SENSOR CIRCUIT LOW INPUT

Circuit Description

The ECM receives a signal from the ignition system to determine engine speed. The TCM sends five volts on circuit 515 to the ECM. The ECM pulses this circuit to ground at the rate of 33 Hz per 1000 rpm. The TCM uses the rpm signal to calculate torque converter slip and TCC apply rate.

The TCM detects low engine rpm when the vehicle has a large input speed, throttle position, and vehicle speed in a drive gear range, then DTC P0727 sets.

Conditions For Setting The DTC

- Transmission not in P (Park) or N (Neutral).
- Engine is running.
- TP is greater than 20%.
- Engine speed is less than 200 rpm.
- Output speed is greater than 600 rpm.
- Input speed is greater than 600 rpm.
- No input speed sensor DTC(s) P0716 or P0717.
- No engine speed DTC P0726
- No vehicle speed DTC(s) P0722 or P0723.
- No TFP Val. Position Sw. DTC P1810
- No TP DTC P1791.
- All the above conditions are met for five seconds.

Action Taken When The DTC Sets

- TCM will flash the Power Lamp.
- Freeze shift adapts from being updated.
- TCM commands maximum line pressure.
- TCM inhibits TCC engagement.

Conditions For Clearing The DTC

- The TCM will turn the Power Lamp off when engine speed is greater than 250 rpm for three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and the ECM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. This step checks for a five volt signal from the TCM.
2. This step checks for a short to power (12V) on circuit 515.
4. This step checks for a short to power (12V) on circuit 515.

DTC P0727 - Engine Speed Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear the DTC(s). 4. Ignition OFF. 5. Disconnect the ECM connector. 6. Ignition ON. 7. Set voltmeter to DC volts. 8. Connect a voltmeter from terminal B13 of the ECM connector to a good ground. Is voltage reading as shown?	5.0 V	Go to Step 2	Go to Step 5
2	Is voltage greater than shown?	u 5.0 V	Go to Step 3	Go to Step 7
3	1. Connect a test light from terminal B13 of the ECM connector to a good ground. 2. Disconnect the TCM connector. Is the test light ON?	-	Go to Step 4	-
4	Check circuit 515 for a short to power. Was the condition found and corrected?	-	Go to Step 8	-
5	Check circuit 515 from the TCM to ECM connector terminal B13 for an open or short to ground. Was the condition found and corrected?	-	Go to Step 8	Go to Step 6
6	Replace the TCM. Is the replacement complete?	-	Go to Step 8	-
7	Replace the ECM. Is the replacement complete?	-	Go to Step 8	-
8	1. After the repair is complete, select scan tool “Clear Info” function and road test the vehicle. 2. Review the “DTC Info”. Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

RANGE	GEAR	1-2 SHIFT SOL	2-3 SHIFT SOL	2ND CLUTCH	2ND ROLLER CLUTCH	INT./4TH BAND	REVERSE CLUTCH	COAST CLUTCH	INPUT SPRAG	DIRECT CLUTCH	FOR-WARD CLUTCH	LO/REV. BAND	LO ROLLER CLUTCH
PARK	N	ON	OFF									Applied	
REV	R	ON	OFF				Applied					Applied	
NEU	N	ON	OFF									Applied	
D	1st	ON	OFF						Holding		Applied		Holding
	2nd	OFF	OFF	Applied	Holding				Holding		Applied		Over-running
	3rd	OFF	ON	Applied*	Over-running				Holding	Applied	Applied		Over-running
	4th	ON	ON	Applied*		Applied			Over-running	Applied	Applied*		Over-running
3	1st	ON	OFF					Applied	Holding		Applied		Holding
	2nd	OFF	OFF	Applied	Holding			Applied	Holding		Applied		Over-running
	3rd	OFF	ON	Applied*	Over-running			Applied	Holding	Applied	Applied		Over-running
2	1st	ON	OFF					Applied	Holding		Applied		Holding
	2nd	OFF	OFF	Applied	Holding	Applied		Applied	Holding		Applied		Over-running
	3rd**	OFF	ON	Applied*	Over-running			Applied	Holding	Applied	Applied		Over-running
1	1st	ON	OFF					Applied	Holding		Applied	Applied	Holding
	2nd***	OFF	OFF	Applied	Holding	Applied		Applied	Holding		Applied		Over-running

ON = SOLENOID ENERGIZED
OFF = SOLENOID DE-ENERGIZED.
* = APPLIED WITH NO LOAD.
** = MANUAL SECOND - THIRD GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 100 km/h (62 mph).
*** = MANUAL FIRST - SECOND GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 60 km/h (37 mph).
NOTE: MANUAL FIRST - THIRD GEAR IS ALSO POSSIBLE AT HIGH VEHICLE SPEED AS A SAFETY FEATURE.

DIAGNOSTIC TROUBLE CODE (DTC) P0730 INCORRECT GEAR RATIO

Circuit Description

The Transmission Control Module (TCM) calculates gear ratio based on the transmission input and output speed sensor readings. The TCM compares the known transmission gear ratio to calculated ratio for the particular gear range selected.

When the TCM detects an unknown transmission gear ratio, then DTC P0730 sets.

Conditions For Setting The DTC

- No Output Speed Sensor DTC(s) P0722 or P0723.
- No Input Speed Sensor DTC(s) P0716 or P0717.
- No TP Sensor DTC P1791.
- No TFP Val. Position Sw. DTC P1810.
- Engine running.
- Time since last manual gear select lever change is greater than three seconds.
- Transmission not in P (Park) or N (Neutral).
- TP is greater than 15%.
- MAP is greater than 10 kPa.
- Vehicle speed is greater than 16 km/h (10 mph).
- Transmission temperature is greater than * 10°C (14°F).
- And one of the following conditions occur:
  - Gear ratio is less than 2.87 or greater than 3.13 for seven seconds.
  - Gear ratio is less than 1.54 or greater than 1.71 for seven seconds.
  - Gear ratio is less than 0.91 or greater than 1.07 for seven seconds.
  - Gear ratio is less than 0.61 or greater than 0.72 for seven seconds.
  - Gear ratio is less than 2.02 or greater than 2.23 for seven seconds.

Action Taken When The DTC Sets

- TCM will command maximum line pressure.
- TCM will freeze shift adapts from being updated.
- TCM will flash the Power Light.
- DTC P0730 will be stored in TCM memory.

Conditions For Clearing The DTC

- No Output Speed Sensor DTCs P0722 or P0723.
- No Input Speed Sensor DTCs P0716 or P0717.
- No TP Sensor DTC P1791.
- No TFP Val. Position Sw. DTC P1810.
- Engine running.
- Time since last manual gear select lever change is greater than three seconds.
- Transmission not in Park or Neutral.
- TP is greater than 15%.
- MAP is greater than 10 kPa.
- Vehicle speed is greater than 16 km/h (10 mph).
- Transmission temperature is greater than * 10°C (14°F).
- All the above conditions are met and any one of the following occur:
  - Gear ratio is between 2.87-3.13 for seven seconds.
  - Gear ratio is between 1.54-1.71 for seven seconds.
  - Gear ratio is between 0.91-1.07 for seven seconds.
  - Gear ratio is between 0.61-0.72 for seven seconds.
  - Gear ratio is between 2.02-2.23 for seven seconds.
- To cancel DTC fail actions, the fault must no longer exist and the ignition must be cycled off for five seconds.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Check for intermittent input speed sensor or output speed sensor circuit problems.
- Check for possible incorrect calibration.

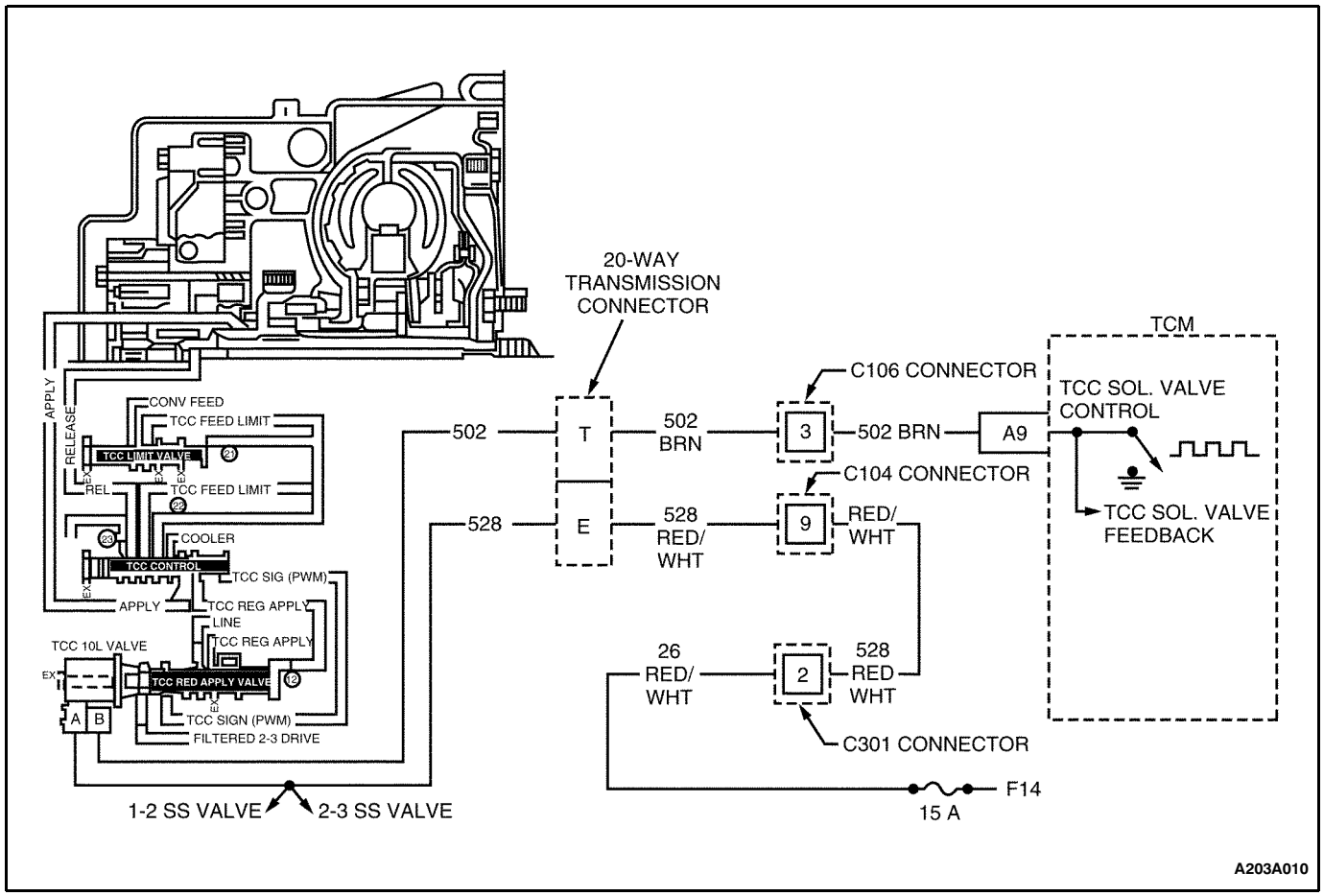
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

2. This step checks for possible low fluid level causing slipping resulting in an undefined gear ratio.
3. This step checks for correct gear ratios for commanded gears.
4. This step checks for low line pressure.

DTC P0730 - Incorrect Gear Ratio

Step	Action	Value(s)	Yes	No
1	Visually inspect the transmission cooling system for fluid leaks. Was condition found and corrected?	5.0 V	Go to Step 6	Go to Step 2
2	Has the transmission fluid checking procedure been performed?	-	Go to Step 3	Go to Transmission Fluid Check, Procedures
3	1. Using the scan tool record each transmission drive range. 2. Drive the vehicle in transmission gear ranges 1, 2, 3, and D with TP greater than 15% and vehicle speed greater than 16 km/h (10 mph) for five seconds. Does commanded gear ratio match ranges as shown?	1st: 2.87-3.13 2nd: 1.54-1.71 3rd: 0.91-1.07 4th: 0.61-0.72	Refer to Diagnostic Aids	Go to Step 4
4	Perform line pressure check. Was the condition found and corrected?	-	Go to Step 6	Go to Step 5
5	Check for possible clutch slippage. Was the condition found and corrected?	-	Go to Step 6	-
6	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0741
TORQUE CONVERTER CLUTCH CIRCUIT STUCK OFF

Circuit Description

The Torque Converter Clutch Solenoid Valve (TCC Sol. Valve) is a pulse width modulated solenoid. The Transmission Control Module (TCM) energizes the TCC Sol. Valve by grounding circuit 502. When vehicle operating conditions are appropriate to apply the TCC, the TCM begins the TCC Sol. Valve duty cycle at 68%. The TCM then ramps the duty cycle up to 93% to achieve full TCC apply pressure.

When the TCC Sol. Valve is de-energized, the solenoid blocks filtered 2-3 drive fluid and allows TCC signal fluid to exhaust. When energized, the solenoid modulates fluid into the TCC signal fluid circuit. When fully energized, modulation stops and the solenoid blocks both 2-3 drive fluid and TCC signal fluid from being exhausted.

When the TCM detects a high TCC slip speed when the TCC is commanded on, then DTC P0741 sets.

Conditions For Setting The DTC

- **No TP DTC P1791.**
- **No TFP Val. Position Sw. DTC P1810.**
- **No VSS DTC(s) P0722 or P0723.**
- **No TCC stuck on DTC P0742.**
- **No TCC release switch DTC P1887.**
- **Transmission is in 2, 3, or D.**
- **Time since last manual gear select lever change is greater than three seconds.**
- **TCM commands TCC ON.**
- **TP is greater than 12%.**
- **Transmission fluid temperature is between 0°C and 120°C (32°F and 248°F).**
- **Commanded gear is greater than 1st gear.**
- **TCC slip speed is 250 rpm or greater for five seconds.**

Action Taken When The DTC Sets

- **The TCM will flash the Power Lamp after two consecutive trips with a failure reported.**
- **DTC P0741 will be stored in TCM memory.**
- **TCM inhibits TCC engagement.**
- **Freeze shift adapts from being updated.**

Conditions For Clearing The DTC

- The TCM will turn the Power Lamp off after DTC P0741 passes condition test. This DTC passes when all conditions for setting the DTC, (except TCC slip is less than 50 rpm for three seconds) are met for three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

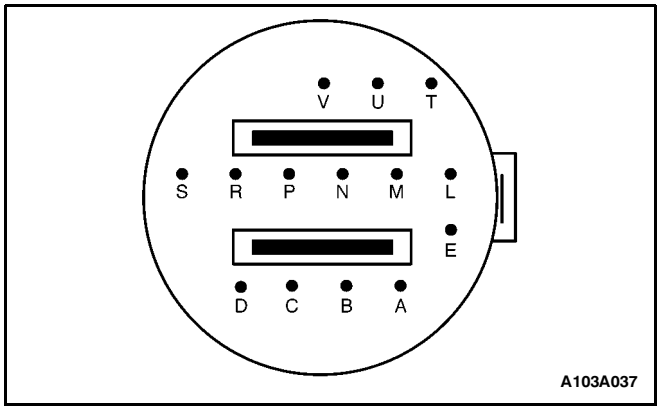
Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wire that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. This test looks for other DTC(s) that would set when the feed circuit is open.
7. This tests the TCM ability to command the TCC Sol. Valve ON and OFF.
9. This tests for proper transmission component/circuit resistance.



DTC P0741 - Torque Converter Clutch Circuit Stuck Off

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). Are DTCs P0751 and P0756 also set?	-	Go to Step 2	Go to Step 5
2	1. Ignition OFF. 2. Inspect circuit 26/524 from the power feed to connector C301 terminal 2 for an open. Was the condition found?	-	Go to Step 3	Go to Step 4
3	Repair short to ground in circuit 26/524. Was the condition found?	-	Go to Step 14	Go to Step 9
4	Repair open in circuit 26/524. Was the condition found and corrected?	-	Go to Step 14	-
5	1. Ignition OFF. 2. Disconnect transmission 20-way connector (additional DTC(s) will set). 3. Using J 35616 Connector Test Adapter Kit, connect a test light from terminal E to a good ground. (See Connector View.) 4. Ignition ON, engine OFF. Is test light ON?	-	Go to Step 7	Go to Step 6
6	Check circuit 528/525 between terminal E and splice for an open. Was the problem found and corrected?	-	Go to Step 14	-

DTC P0741 - Torque Converter Clutch Circuit Stuck Off (Cont'd)

Step	Action	Value(s)	Yes	No
7	1. Connect a test light from terminal E to terminal T. 2. With the scan tool, command TCC Duty Cycle 100% and then 0%. Is test light ON when commanded 100% and OFF when commanded 0%?	-	Go to Step 9	Go to Step 8
8	Check circuit 502 for an open. Was the problem found and corrected?	-	Go to Step 14	Go to Step 12
9	Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal E to terminal T. (See Transmission Connector View.) Does ohmmeter display resistance as shown?	11 to 15 W	Go to Step 13	Go to Step 10
10	Check circuit 528 and 502 from transmission 20-way connector to TCC Sol. Valve for an open. Was the condition found and corrected?	-	Go to Step 14	Go to Step 11
11	Replace the TCC Sol. Valve. Is the replacement complete?	-	Go to Step 14	-
12	Replace the TCM. Is the replacement complete?	-	Go to Step 14	-
13	Repair TCC shift valve circuit. Inspect for: • Leak at TCC Sol. Valve. • TCC regulator apply valve stuck in the release position. • TCC control valve stuck in the release position. • Plugged TCC Sol. Valve filter. Is the repair complete?	-	Go to Step 14	-
14	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

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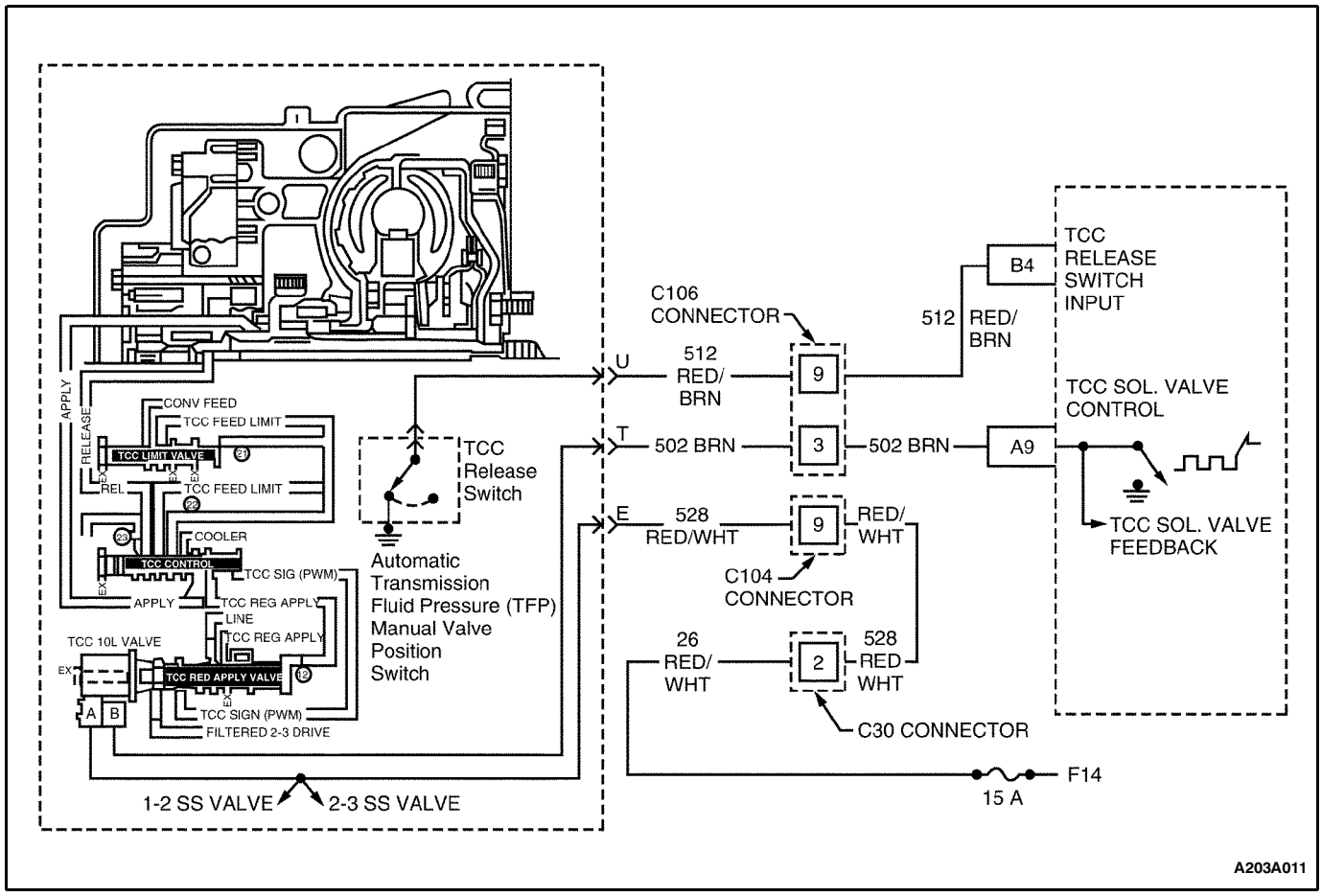


DIAGNOSTIC TROUBLE CODE (DTC) P0742
TORQUE CONVERTER CLUTCH CIRCUIT STUCK ON

Circuit Description

The Torque Converter Clutch Solenoid Valve (TCC Sol. Valve) is a pulse width modulated solenoid. The Transmission Control Module (TCM) energizes the TCC Sol. Valve by grounding circuit 502. When vehicle operating conditions are appropriate for TCC application, the TCM begins the TCC duty cycle at approximately 68%. The TCM then increases the duty cycle up to 93%, in order to achieve full TCC-apply pressure.

When the TCC Sol. Valve is de-energized, the solenoid blocks filtered 2-3 drive fluid, and allows TCC signal fluid to exhaust. When energized, the solenoid modulates fluid into the TCC signal fluid circuit. When fully energized, modulation stops, and the solenoid blocks both 2-3 drive fluid and TCC signal fluid exhaust.

The Torque Converter Clutch (TCC) release switch is part of the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.). The TFP Val. Position Sw. is mounted to the transmission valve body.

The TCC release switch is a normally-closed switch. Torque Converter release fluid pressure acts on the switch contact, opening the circuit, signaling the TCM that the TCC is released. When the voltage on the circuit is high, the TCM recognizes that the TCC is no longer engaged.

When the TCM detects that the TCC release switch is closed when the TCC is commanded off, then DTC P0742 sets.

Conditions For Setting The DTC

- **No TCC release DTC P1887.**
- **No TP DTC P1791.**
- **Engine running.**
- **Time since last manual gear select lever change is greater than three seconds.**
- **TP is greater than 20%.**
- **TCC commanded off.**
- **TCC release switch is closed.**
- **All the above conditions met for eight seconds.**

Action Taken When The DTC Sets

- The TCM will flash the Power Lamp.
- DTC P0742 will be stored in TCM memory.
- Freeze shift adapts from being updated.
- TCC commanded on in 2nd, 3rd, and 4th gears.

Condition For Clearing DTC

- The TCM will turn the Power Lamp off after DTC P0742 passes condition test. This DTC passes when all conditions for setting the DTC are true, (except TCC release switch is open when TCC is commanded off for three seconds) for three consecutive ignition cycles.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Rapid fluctuation in line pressure could set a DTC P0742.
- Check for a possible pressure regulator problem.
- Check for possible high or low line pressure.
- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

2. This step tests for a TCC release switch status change when the engine is running. If TCC release oil is present, the switch should be open.
3. If you disconnect the transmission connector, the TCM should recognize an open TCC Release switch. This indicates the wiring from the transmission connector to the TCM is OK.
11. This step tests circuit 502 from the transmission connector to the TFP Val. Position Sw. for a short to ground.
16. This step ensures that the TCC release switch is in good working condition.
18. This step tests the TCC circuit for a mechanical or hydraulic problem.

DTC P0742 - Torque Converter Clutch Circuit Stuck On

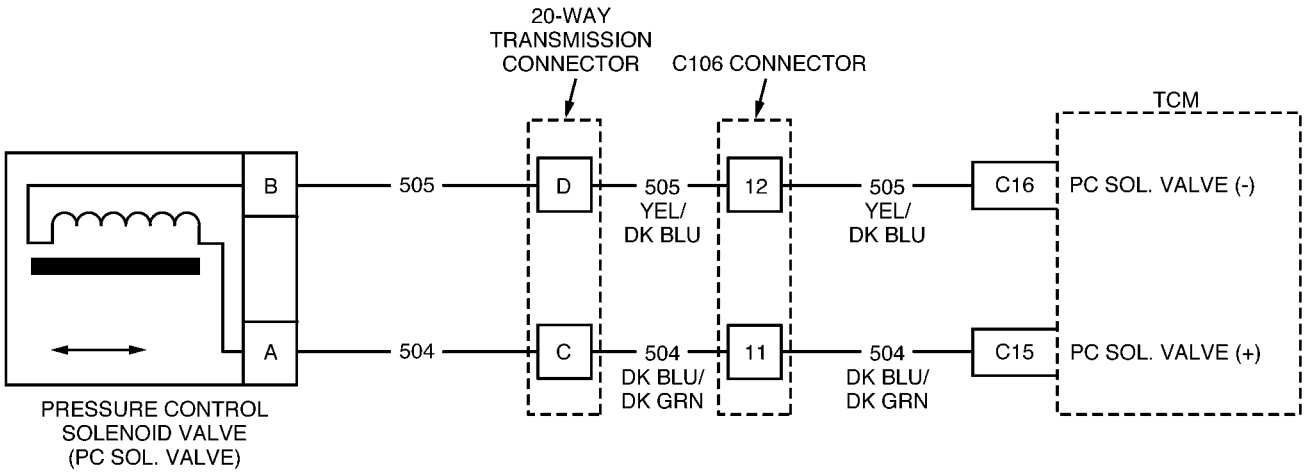
Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. With the engine OFF, turn the ignition switch to the ON position. 3. Record then clear the DTC(s). 4. Select scan tool TCC Release switch. Is the TCC Release Switch status as shown?	Closed	Go to Step 2	Go to Diagnostic Aids
2	Start the engine Is the TCC Release Switch status as shown?	Open	Go to Step 8	Go to Step 3
3	1. Ignition OFF. 2. Disconnect the transmission 20-way connector. 3. With the engine OFF, turn the ignition switch to the ON position. Is the TCC Release Switch status as shown?	Open	Go to Step 4	Go to Step 6
4	Inspect circuit 512 from the transmission 20-way connector to the TFP Val. Position SW. for a short to ground. Was the condition found?	-	Go to Step 5	Go to Step 16
5	Repair the short to ground in circuit 512. Is the repair complete?	-	Go to Step 20	-
6	Inspect circuit 512 from the transmission connector to the TCM for a short to ground. Was the condition found?	-	Go to Step 7	Go to Step 15

DTC P0742 - Torque Converter Clutch Circuit Stuck On (Cont'd)

Step	Action	Value(s)	Yes	No
7	Repair the short to ground in circuit 512. Is the repair complete?	-	Go to Step 20	-
8	1. Install the J 39775 Jumper Harness to the engine 20-way connector. 2. Using the J 35616 Connector Test Adapter Kit, connect a test lamp from battery power to terminal T of the jumper harness. Is the test lamp ON?	-	Go to Step 9	Go to Step 11
9	Inspect circuit 502 from the engine 20-way connector to the TCM for a short to ground. Was the condition found?	-	Go to Step10	Go to Step 19
10	Repair the short to ground in circuit 502. Is the repair complete?	-	Go to Step 20	-
11	1. Ignition OFF. 2. Disconnect the J 39775 Jumper Harness from the engine 20-way connector. 3. Instal the J 39775 Jumper Harness to the transmission 20-way connector. 4. Using the J 35616 from battery power to terminal T. Is the test lamp ON?	-	Go to Step 12	Go to Step 18
12	Inspect circuit 502 from the transmission connector to the Torque Converter Clutch Solenoid Valve (TCC Sol. Valve) for a short ground. Was the condition found?	-	Go to Step 13	Go to Step 14
13	Repair circuit 502 from the transmission connector to the TCC Sol. Valve. Is the repair complete?	-	Go to Step 20	-
14	Inspect the TCC Sol. Valve for an internal short. Was the condition found?	-	Go to Step 15	-
15	Replace the TCC Sol. Valve. Refer to Torque Converter Clutch Solenoid Valve Replacement. Is the replacement complete?	-	Go to Step 20	-
16	1. Remove the TFP Val. Position Sw. 2. Inspect the TCC Release Switch for the following conditions: • A damaged or leaking seal. • Sediment or debris in the switch. • Damaged switch contacts. • Stuck switch contacts. Were any of these conditions found?	-	Go to Step 17	-
17	Replace the TFP Val. Position Sw. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Replacement. Is the replacement complete?	-	Go to Step 20	-

DTC P0742 - Torque Converter Clutch Circuit Stuck On (Cont'd)

Step	Action	Value(s)	Yes	No
18	Inspect the TCC hydraulic circuit for the following conditions: • TCC PWM solenoid exhaust plugged. • The TCC regulator apply valve stuck in the apply position. • The TCC control valve stuck in the apply position. • The TCC feed limit valve stuck (this causes the TCC feed limit pressure, and the TCC release pressure to be low or nonexistent). • A stuck pressure regulator valve. Is the repair complete?	-	Go to Step 20	-
19	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 20	-
20	1. After the repair is complete, select scan tool "Clear info" function and road test the vehicle. 2. Review the "DTC info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0748
PRESSURE CONTROL SOLENOID CIRCUIT ELECTRICAL

Circuit Description

The Pressure Control Solenoid Valve (PC Sol. Valve) is used to regulate transmission line pressure. The PC Sol. Valve consists of an electrical connector, coil, armature, regulating spring and a poppet valve. The PC Sol. Valve is attached to the upper control body. The TCM compares TP voltage, engine rpm and other inputs to determine the line pressure appropriate for a given load. The TCM will regulate pressure by applying a varying amperage to the PC Sol. Valve. The applied amperage can vary from 0.1 to 1.0 amps. The TCM then monitors the amperage at the return line.

When the TCM detects a continuous open or short to ground in PC Sol. Valve circuit or the PC Solenoid Valve, then DTC P0748 sets.

Conditions For Setting The DTC

- **System voltage is 10-17 volts.**

Action Taken When The DTC Is Set

- **Freeze shift adapts from being updated.**
- **TCM commands maximum line pressure (0 Amps).**
- **DTC P0748 will be stored in TCM memory.**
- **TCM will NOT flash the Power Lamp.**

Conditions For Clearing The DTC

- **System voltage is 10-17 volts.**
- **History DTC(s) can be cleared by using a Scan Tool.**

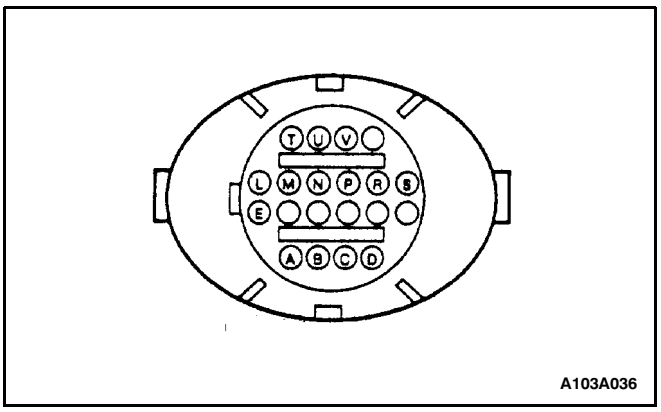
Diagnostic Aids

- **Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.**
- **If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.**
- **Extended engine cranking with a low battery could set DTC P0748.**

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. **This test checks the ability of the TCM to command the PC Sol. Valve.**
2. **This test checks internal transmission wiring and the PC Sol. Valve for correct resistance.**
7. **This test checks circuit 505 of the transmission wiring for a short to ground.**
8. **This test checks circuit 505 from the engine 20-way connector for a short to ground.**
9. **This test checks circuit 505 from the engine 20-way connector to the TCM for an open.**
10. **This test checks circuit 504 from the engine 20-way connector to the TCM for a short to ground.**
11. **This test checks circuit 504 from the engine 20-way connector to the TCM for an open.**



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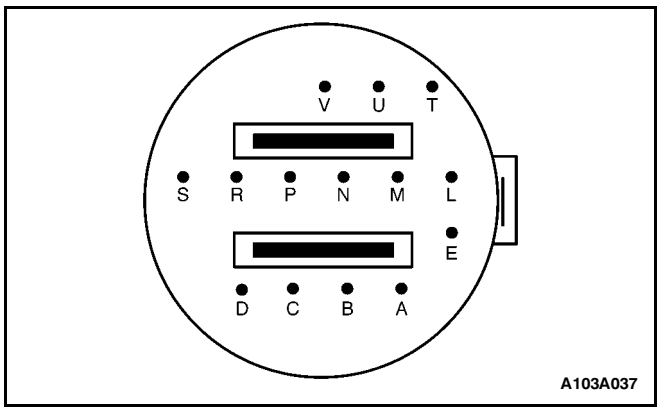

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DTC P0748 - Pressure Control Solenoid Circuit Electrical

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Record then clear DTC(s). 3. Start engine. 4. Select scan tool PC Solenoid. 5. Using the scan tool, apply 0.1 through 1.0 Amps and observe the display. Is the PC Act. Current Amp reading within specification of desired PC Ref. Current Amp reading as shown?	0.16 Amps	Go to Diagnostic Aids	Go to Step 2
2	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal C to terminal D. (See Transmission Connector View.) Does the ohmmeter display range as shown?	3 to 7 W	Go to Step 7	Go to Step 3
3	Is the resistance value greater than shown?	7 W	Go to Step 4	Go to Step 5
4	Check circuit 504 and 505 for an open. Was the condition found and corrected?	-	Go to Step 19	Go to Step 9
5	Is the resistance value less than shown?	3 W	-	Go to Step 6
6	Check circuit 504 and 505 for being shorted together. Was the condition found and corrected?	-	Go to Step 19	Go to Step 9
7	Connect an ohmmeter from terminal D to a good ground. Is the resistance value less than shown?	¦ 1000 W	Go to Step 8	Go to Step 10
8	Check circuit 504 or 505 from transmission 20-way connector to PC Sol. Valve for a short to ground. Is the resistance value less than shown?	-	Go to Step 19	Go to Step 9
9	Replace the Pressure Control Solenoid Valve. Refer to PC Sol. Valve Replacement. Was the replacement completed?	-	Go to Step 19	-

DTC P0748 - Pressure Control Solenoid Circuit Electrical (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Disconnect the TCM connector (additional DTC(s) will set). 2. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal D to a good ground. (See Connector View.) Does the ohmmeter display resistance as shown?	¦ 10 W	Go to Step 12	Go to Step 11
11	Check circuit 505 for a short to ground. Was the condition found and corrected?	-	Go to Step 19	-
12	Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal D of the connector to TCM terminal C16. Does the ohmmeter display resistance as shown?	¦ 10 W	Go to Step 14	Go to Step 13
13	Check circuit 505 for an open. Was the condition found and connected?	-	Go to Step 19	-
14	Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal C of the connector to a good ground. Does the ohmmeter display resistance as shown?	¦ 10 W	Go to Step 16	Go to Step 15
15	Check circuit 504 for a short to ground. Was the condition found and corrected?	-	Go to Step 19	-
16	Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal C of the connector to TCM terminal C15. Does the ohmmeter display resistance as shown?	¦ 10 W	Go to Step 18	Go to Step 17
17	Check circuit 504 for an open. Was the condition found and corrected?	-	Go to Step 19	-
18	Replace the TCM. Was the replacement completed?	-	Go to Step 19	-
19	1. After the repair, use a scan tool "Clear Info." function an road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is a current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

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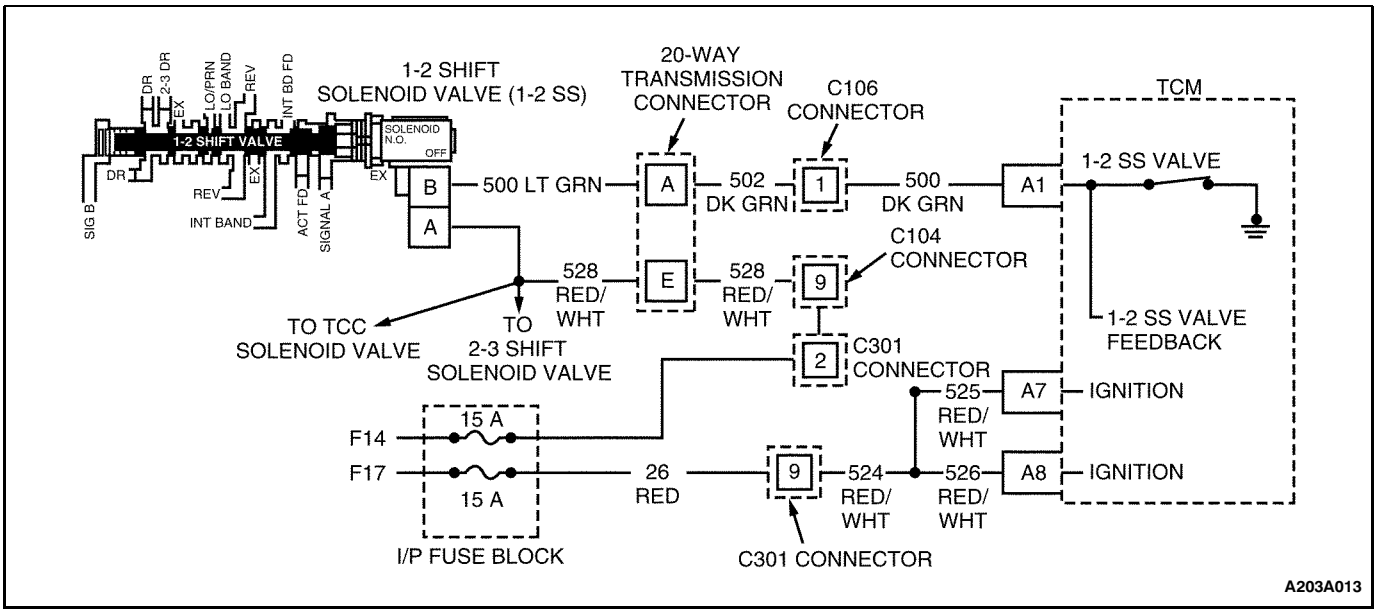


DIAGNOSTIC TROUBLE CODE (DTC) P0751
1-2 SHIFT SOLENOID PERFORMANCE

Circuit Description

The 1-2 Shift Solenoid Valve (1-2 SS Valve) is used to control fluid flow acting on the 1-2 shift valve. The solenoid is a normally open valve that is used in conjunction with the 2-3 Shift Solenoid Valve (2-3 SS Valve) to allow four different shifting combinations (Refer to Shift Solenoid Chart). The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM). The TCM commands the solenoid ON or OFF by providing a ground path through circuit 500.

The Transmission Control Module (TCM) monitors the actual gear ratio, and compares the actual gear ratio with the commanded gear ratio. DTC P0751 sets under four conditions:

- **A stuck ON 1-2 SS Valve.**
- **A stuck OFF 1-2 SS Valve.**
- **A stuck ON 1-2 shift Valve.**
- **A stuck OFF 1-2 shift Valve.**

Conditions For Setting The DTC

- **No Input Speed Sensor DTC(s) P0716 or P0717.**
- **No TFP Val. Position Sw. DTC P1810.**
- **No TP Sensor DTC P1791.**
- **No Vehicle Speed Sensor DTC(s) P0722 or P0723.**
- **Engine running.**
- **MAP is greater than 20 kPa.**
- **Transmission not in Park, Neutral or Reverse.**
- **Transmission Fluid Temperature is greater than * 10°C (14°F).**
- **Vehicle speed above 8 km/h (5 mph).**
- **TP is greater than 8%.**

All the above conditions are true and any one of the following conditions occur:

- **TCM commands 1st gear and 2nd gear ratio between 1.54-1.71 is detected for 2 seconds.**
- **TCM commands 2nd gear and 1st gear ratio between 2.87-3.13 is detected for 4 seconds.**
- **TCM commands 3rd gear and 4th gear ratio between 0.67-0.72 is detected for 5 seconds.**
- **TCM commands 4th gear and 3rd gear ratio between 0.93-1.05 is detected for 5 seconds.**

Action Taken When The DTC Is Set

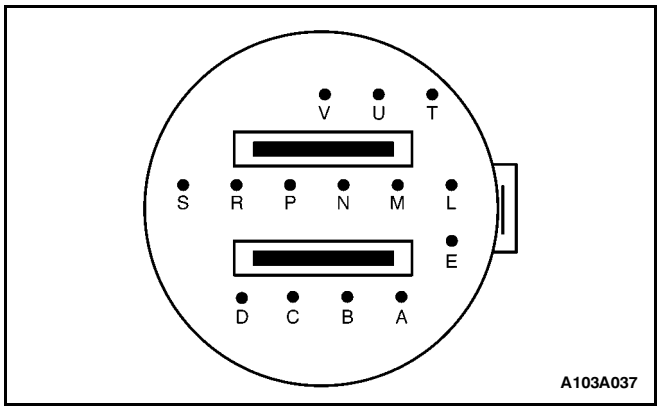
- **TCM will flash the Power Lamp after two consecutive trips with a failure reported.**
- **Freeze shift adapts from being updated.**
- **TCM inhibits TCC engagement.**
- **TCM commands maximum line pressure.**
- **TCM commands soft landing to 2nd gear.**
- **DTC P0751 will be stored in TCM memory.**

Conditions For Clearing The DTC

- **The TCM will turn the Power Lamp off after DTC P0751 passes condition test. This DTC passes when all conditions for setting the DTC are met and the gear ratio matches the commanded gear for three consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a Scan Tool.**

Diagnostic Aids

- If the DTC cannot be reset after clearing the code, check for possible fluid contamination, plugged or restricted oil circuit.
- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.



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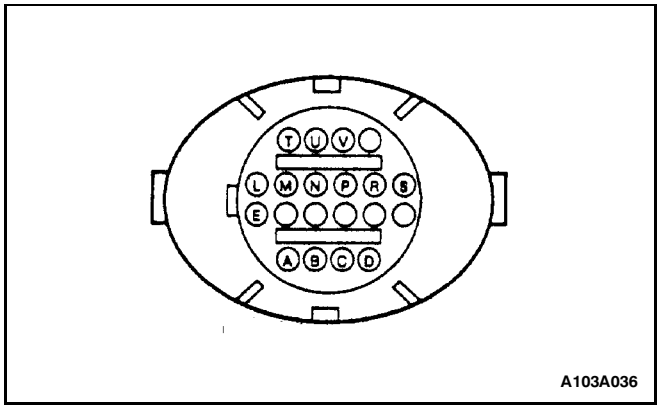

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Shift Solenoid Status Chart

Gear	1-2 Shift Solenoid Valve	2-3 Shift Solenoid Valve
1st	ON	OFF
2nd	OFF	OFF
3rd	OFF	ON
4th	ON	ON

DTC P0751 - 1-2 Shift Solenoid Performance

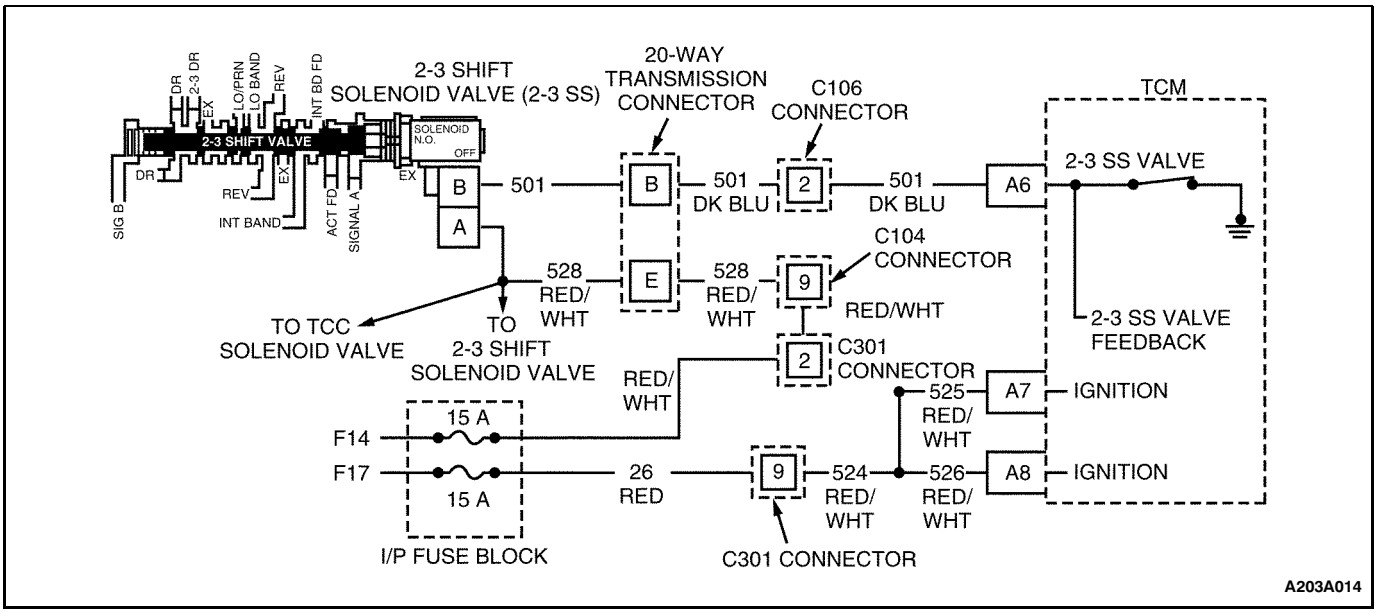
Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). Are DTCs P0741 and P0756 also set?	-	Go to Step 2	Go to Step 5
2	Inspect circuit 26/524 from the power feed to connector C301 terminal 9 for an open. Was condition found?	-	Go to Step 3	Go to Step 4
3	Repair the short to ground in circuit 26/524. Was the condition found and corrected?	-	Go to Step 29	-
4	Check circuit 528 for an open. Was the condition found and corrected?	-	Go to Step 29	-
5	1. Select scan tool 1-2 Shift Solenoid. 2. Command solenoid ON and OFF three times. 3. Listen at transmission side cover. Does the solenoid click when commanded ON and OFF?	-	Go to Step 24	Go to Step 6
6	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Using J 35616 Connector Test Adapter Kit, connect a test light from terminal E to terminal A. (See Connector View.) 4. Ignition ON, engine OFF. 5. Command the 1-2 shift solenoid ON and OFF three times. Does the test light cycle ON and OFF as commanded?	-	Go to Step 14	Go to Step 7

DTC P0751 - 1-2 Shift Solenoid Performance (Cont'd)

Step	Action	Value(s)	Yes	No
7	Is the test light always ON?	-	Go to Step 8	Go to Step 11
8	1. Ignition OFF. 2. Disconnect the TCM connector (additional DTC(s) will set). 3. Ignition ON. Is the test light ON?	-	Go to Step 9	Go to Step 12
9	Check circuit 500 for a short to ground. Was the problem found?	-	Go to Step 10	-
10	Repair the short to ground in circuit 500. Is the repair complete?	-	Go to Step 29	-
11	Is the test light always OFF?	-	Go to Step 12	-
12	Check circuit 500 for an open. Was the problem found and corrected?	-	Go to Step 13	Go to Step 19
13	Repair the open in circuit 500. Is the repair complete?	-	Go to Step 29	-
14	1. Ignition OFF. 2. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal E to terminal A. (See Transmission Connector View.) Does the ohmmeter display resistance as shown?	19 to 31 W	Go to Step 17	Go to Step 15
15	Is the resistance greater than shown?	§ 250 W	Go to Step 16	Go to Step 17
16	Check circuit 500 and 528 from 20-way transmission connector to the 1-2 SS Valve for an open or poor connection at solenoid connector. Was the problem found and corrected?	-	Go to Step 29	-
17	Connect the ohmmeter from terminal A to a good ground. Is the resistance less than shown?	¦ 1000 W	Go to Step 18	Go to Step 22
18	Check circuit 500 for a short to ground. was the problem found and corrected?	-	Go to Step 29	-
19	Connect a test light from a good ground to terminal A. Is the test light ON?	-	Go to Step 20	Go to Step 23
20	Check circuit 500 for a short to battery power. Was the problem found?	-	Go to Step 21	-
21	Repair the short to battery power in circuit 500. Is the repair complete?	-	Go to Step 29	-
22	Replace the 1-2 Shift Solenoid valve. Refer to Solenoid Replacement. Is the replacement complete?	-	Go to Step 29	-
23	Replace the TCM. Is the replacement complete?	-	Go to Step 29	-
24	Has the transmission fluid checking procedure been performed?	-	Go to Step 25	Go to Transmission Fluid Check

DTC P0751 - 1-2 Shift Solenoid Performance (Cont'd)

Step	Action	Value(s)	Yes	No
25	1. Use the scan tool to record current gear and gear ratio. 2. Drive the vehicle in D to obtain 1-2, 2-3, and 3-4 shifts with TP greater than 8% and vehicle speed greater than 8 km/h (5mph) for three seconds. Is the current gear 2nd and the gear ratio within range shown?	2.87-3.13	Go to Step 27	Go to Step 26
26	Is the current gear 1st and the gear ratio within range shown?	1.54 -1.71	Go to Step 28	Go to Step 27
27	Is the commanded gear 3rd and the gear ratio within range shown?	0.67-0.72	Go to Step 29	Go to Step 28
28	Is the commanded gear 4th and the gear ratio within range shown?	0.93-1.05	Go to Step 30	Go to Diagnostic Aids
29	Repair the 1-2 shift circuit. Check 1-2 shift circuit for the following: • 1-2 shift Solenoid Valve mechanically stuck OFF. • 1-2 Shift Solenoid Valve O-ring damage. • 1-2 Shift valve stuck in released (downshift) position. Was the condition found and corrected?	-	Go to Step 31	-
30	Repair the 1-2 shift circuit. Check 1-2 shift circuit for the following: • 1-2 Shift Valve mechanically stuck on. • 1-2 Shift valve stuck in applied (upshift) position. • 1-2 Shift valve stuck in released (downshift) position. Was the condition found and corrected?	-	Go to Step 31	-
31	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P0756
2-3 SHIFT SOLENOID PERFORMANCE

Circuit Description

The 2-3 Shift Solenoid Valve (2-3 SS Valve) is a normally open valve that is used in conjunction with the 1-2 Shift Solenoid Valve (1-2 SS Valve) to allow four different shifting combinations (Refer to Shift Solenoid Chart). The 2-3 SS Valve blocks 2-3 signal fluid from exhausting. 2-3 Signal fluid is routed to both the 1-2 and 2-3 shift valves. The solenoid is attached to the valve body within the transmission. Voltage is supplied directly to the solenoid through the Transmission Control Module (TCM). The TCM commands the solenoid ON or OFF by providing a ground path through circuit 500.

The Transmission Control Module (TCM) monitors the actual gear ratio, and compares the actual gear ratio with the commanded gear ratio. DTC P0756 sets under four conditions:

- **A stuck ON 2-3 SS Valve.**
- **A stuck OFF 2-3 SS Valve.**
- **A stuck ON 2-3 shift Valve.**
- **A stuck OFF 2-3 shift Valve.**

Conditions For Setting The DTC

- **No TFP Val. Position Sw. DTC P1810.**
- **No TP Sensor DTC P1791.**
- **No Input Speed Sensor DTC(s) P0716 or P0717.**
- **No Vehicle Speed Sensor DTC(s) P0722 or P0723.**
- **Engine running.**
- **Transmission is in D, 3, 2 or 1.**
- **Vehicle speed above 8 km/h (5 mph).**
- **TP is greater than 8%.**
- **No MAP is greater than 20 kPa.**
- **Transmission fluid temperature is greater than * 10°C (14°F).**

All the above conditions are true and any one of the following conditions occur:

- **TCM commands 1st gear and 4th gear ratio between 0.67-0.72 is detected for 2 seconds.**
- **TCM commands 2nd gear and 3rd gear ratio between 0.93-1.05 is detected for 2 seconds.**
- **TCM commands 3rd gear and 2nd gear ratio between 1.54-1.71 is detected for 3 seconds.**
- **TCM commands 4th gear and 1st gear ratio between 2.87-3.13 is detected for 4 seconds.**

Action Taken When The DTC Is Set

- **TCM will flash the Power Lamp.**
- **Freeze shift adapts from being updated.**
- **TCM inhibits TCC engagement.**
- **TCM commands maximum line pressure.**
- **Immediate landing to 2nd gear.**
- **DTC P0756 will be stored in TCM memory.**

Conditions For Clearing The DTC

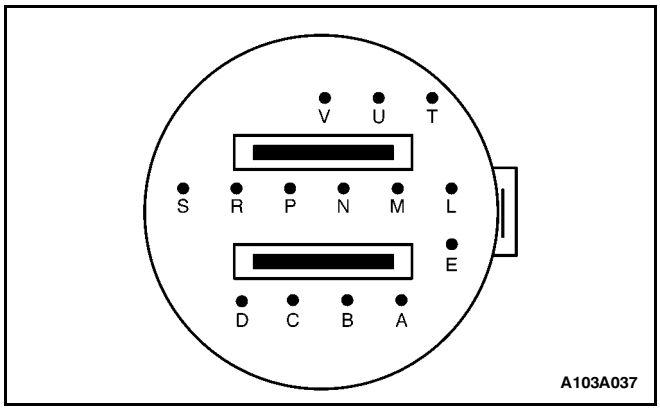
- **The TCM will turn the Power Lamp off after DTC P0756 passes condition test. This DTC passes when all conditions for setting the DTC are met and the gear ratio matches the commanded gear for 3 consecutive ignition cycles.**
- **History DTC(s) can be cleared by using a scan tool.**

Diagnostic Aids

- If the DTC cannot be reset after clearing the code, check for possible fluid contamination, plugged or restricted oil circuit.
- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Shift Solenoid Status Chart

Gear	1-2 Shift Solenoid Valve	2-3 Shift Solenoid Valve
1st	ON	OFF
2nd	OFF	OFF
3rd	OFF	ON
4th	ON	ON



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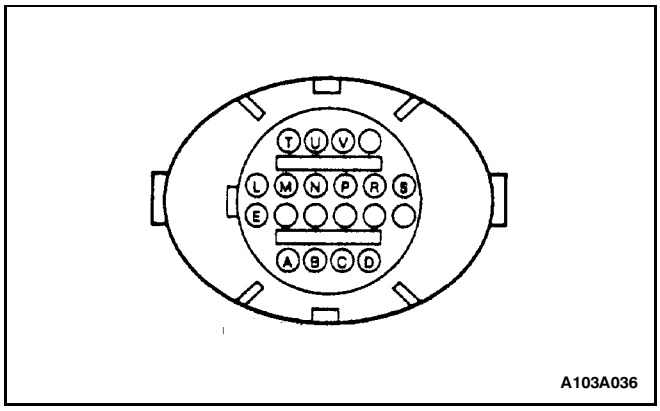

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DTC P0756 - 2-3 Shift Solenoid Performance

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. record then clear DTC(s). Are DTCs P0751 and P0741 also set?	-	Go to Step 2	Go to Step 5
2	Inspect circuit 26/524 from the power feed to connector C301 terminal 9 for an open. Was the condition found?	-	Go to Step 3	Go to Step 4
3	Repair the short to ground in circuit 26/524. Was the condition found and corrected?	-	Go to Step 29	-
4	Check circuit 528 for an open. Was the condition found and corrected?	-	Go to Step 29	-
5	1. Select scan tool 2-3 shift solenoid. 2. Command solenoid ON and OFF three times. 3. Listen at transmission side cover. Does the solenoid click when commanded ON and OFF?	-	Go to Step 24	Go to Step 6
6	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Using J 35616 Connector Test Adapter Kit, connect a test light from terminal E to terminal B. (See Connector View.) 4. Ignition ON, engine OFF. 5. Command the 2-3 Shift Solenoid ON and OFF three times. Does the test light cycle ON and OFF as commanded?	-	Go to Step 14	Go to Step 7

DTC P0756 - 2-3 Shift Solenoid Performance (Cont'd)

Step	Action	Value(s)	Yes	No
7	Is the test light always ON?	-	Go to Step 8	Go to Step 11
8	1. Ignition OFF. 2. Disconnect the TCM connector (additional DTC(s) will set). 3. Ignition ON. Is the test light ON?	-	Go to Step 9	Go to Step 12
9	Check circuit 501 for a short to ground. Was the problem found?	-	Go to Step 10	-
10	Repair short to ground in circuit 501. Is the repair complete?	-	Go to Step 29	-
11	Is the test light always OFF?	-	Go to Step 12	-
12	Check circuit 501 for an open. Was the problem found?	-	Go to Step 13	Go to Step 19
13	Repair the open in circuit 501. Is the repair complete?	-	Go to Step 29	-
14	1. Ignition OFF. 2. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal E to terminal B. (See Transmission Connector View.) Does the ohmmeter display resistance as shown?	19 to 31 W	Go to Step 17	Go to Step 15
15	Is the resistance greater than shown?	§ 250 W	Go to Step 16	Go to Step 17
16	Check circuit 501 and 528 from the transmission connector to the solenoid for an open or poor connection at connector. Was the problem found and corrected?	-	Go to Step 29	-
17	Connect the ohmmeter from terminal B to a good ground is the resistance less than shown?	¦ 1000 W	Go to Step 18	Go to Step 22
18	Check circuit 501 for a short to ground. Was the problem found and corrected?	-	Go to Step 29	-
19	Connect a test light from a good ground to terminal B. Is the test light ON?	-	Go to Step 20	Go to Step 23
20	Check circuit 501 for a short to battery power. Was the problem found?	-	Go to Step 21	-
21	Repair the short to battery power in circuit 501. Is the repair complete?	-	Go to Step 29	-
22	Replace 2-3 Shift Solenoid Valve. Refer to Solenoid Replacement. Is the replacement complete?	-	Go to Step 29	-
23	Replace the TCM. Is the replacement complete?	-	Go to Step 29	-
24	Has the transmission fluid checking procedure been performed?	-	Go to Step 25	Go to Transmission Fluid Check

DTC P0756 - 2-3 Shift Solenoid Performance (Cont'd)

Step	Action	Value(s)	Yes	No
25	1. Use the scan tool to record current gear and gear ratio. 2. Drive the vehicle in D to obtain a 2-3 shift with TP greater than 8% and vehicle speed greater than 8 km/h (5 mph) for three seconds. Are gear rations within given gear range?	1st: 2.87 - 3.13 4th: 0.61 - 0.72	Go to Diagnostic Aids	Go to Step 26
26	Does the engine labor upon start off, or is 3rd gear indicated when 1st gear is commanded?	-	Go to Step 28	Go to Step 27
27	Repair 2-3 Shift circuit. Check 2-3 Shift Solenoid Valve mechanically stuck off. • Solenoid O-ring damage. • 2-3 valve stuck in released position. Was the condition found and corrected?	-	Go to Step 29	-
28	Repair 2-3 shift circuit. Check 2-3 shift circuit for the following: • 2-3 Shift Solenoid Valve mechanically stuck off. • 2-3 Shift valve stuck in applied position. Was the condition found and corrected?	-	Go to Step 29	-
29	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

DIAGNOSTIC TROUBLE CODE (DTC) P1790
TCM CHECKSUM ERROR

Circuit Description

A normal function of the transmission control module (TCM) programming is to perform an internal check that verifies the integrity of the RAM and ROM memory allocations. This function is called a checksum. When the TCM runs this check and the memory allocations do not agree with the previous checksum, then DTC P1790 will set.

Conditions For Setting The DTC

- Ignition ON.
- TCM checksum is incorrect.

Action Taken When The DTC Is Set

- TCM commands maximum line pressure.
- TCM commands 2nd gear.
- TCM inhibits TCC engagement.
- Freeze shift adapts from being updated.
- TCM flashes the power lamp.
- DTC P1790 will be stored in TCM memory.

Conditions For Clearing The DTC

- The TCM will turn the power lamp off after the TCM checksum is correct for three consecutive ignition cycles.
- History DTC(s) can be cleared by using a scan tool.

Diagnostic Aids

Flashing the TCM is not recommended. When DTC P1790 sets, the TCM must be replaced.

DTC P1790 TCM Checksum Error

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. Turn the ignition switch to the ON position. 3. Record, then clear the DTC(s). 4. Turn the ignition OFF for 30 seconds. 5. Engine running. Does the DTC P1790 reset?	-	Go to Step 2	Go to Diagnostic Aids
2	Replace the TCM. Is the replacement complete?	-	Verify repair and exit DTC chart	Refer to TCM replacement procedures

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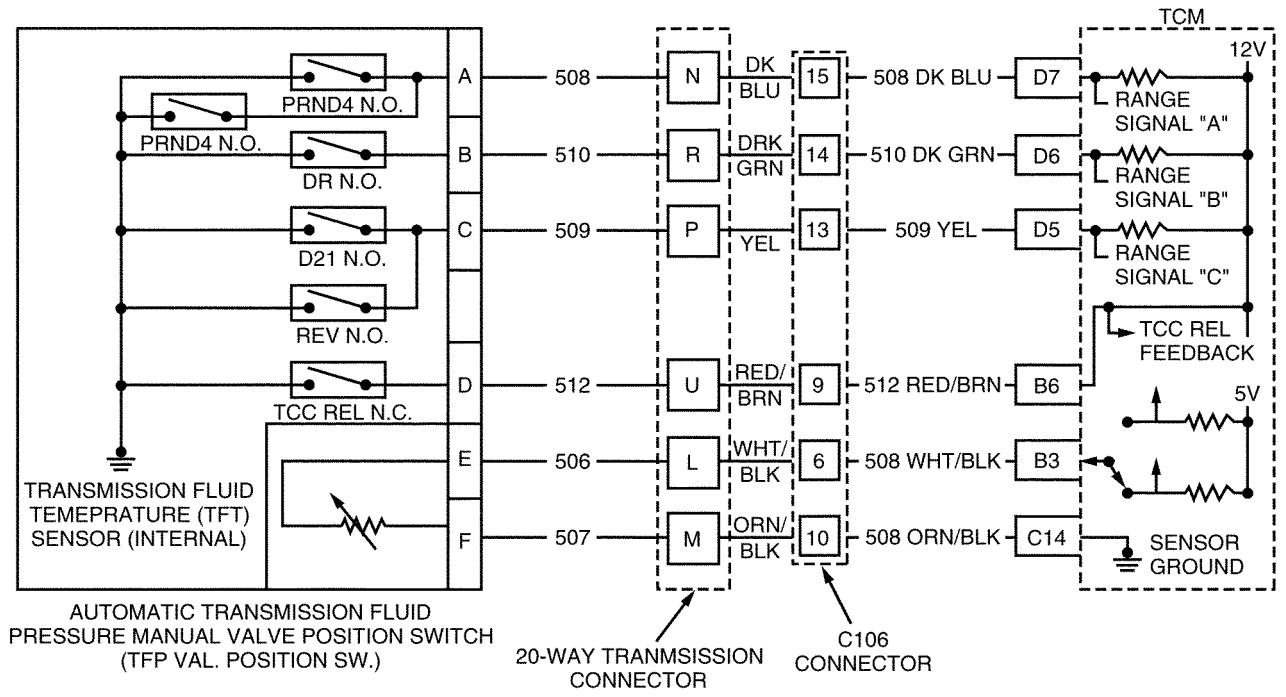

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DIAGNOSTIC TROUBLE CODE (DTC) P1810 AUTOMATIC TRANSMISSION FLUID PRESSURE MANUAL VALVE POSITION SWITCH (TFP VAL. POSITION SW.) MALFUNCTION

Circuit Description

The Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) consists of six pressure switches. Five of the switches are normally open and are used for determining gear range selection. The sixth switch is a normally closed switch and is used to detect TCC release fluid pressure. The TFP Val. Position Sw. also contains a Trans Fluid Temperature (TFT) sensor. These components are combined into one unit and mounted on the valve body.

The TCM provides battery voltage on each range signal. By grounding one or more of these switches with fluid pressure from the manual shift valve, the TCM detects what gear range has been selected. When the transmission electrical connector is disconnected and the ignition is on, the ground potential for three range signals from the TCM will be removed and an illegal gear will be indicated.

When the TCM detects an invalid state of the TFP Val. Position Sw. then DTC P1810 sets.

Conditions For Setting The DTC

This DTC will set under any one of the following three conditions:

Condition 1

- **Engine running.**
- **Gear range is illegal for five seconds.**

Condition 2

- **No VSS DTC(s) P0722 or P0723.**
- **Engine speed is in transition from 0 to more than 500 rpm.**
- **TFP Val. Position Sw. indicates D2, D4 or reverse at engine start-up.**
- **All the above conditions are met for 2 seconds.**

Condition 3

- **Engine running.**
- **No TP DTC P1791.**
- **No VSS DTC(s) P0722 or P0723.**

- No Input Speed Sensor DTC(s) P0716 or P0717.
- MAP is 10-105 kPa.
- No shift solenoid DTC(s) P0751 or P0756.
- Vehicle speed is equal to or greater than 8 km/h (5 mph).
- TP is greater than 10%.

And any one of the following three conditions occur:

- TFP Val. Position Sw. indicates P (Park)/N (Neutral) when gear ratio is less than 0.72 (4th gear) for 5 seconds.
- TFP Val. Position Sw. indicates Reverse when ratio is greater than 2.23 or less than 2.02 for 5 seconds.
- TFP Val. Position Sw. indicates D, 3, 2, or 1 when ratio indicates Reverse for 5 seconds.

Action Taken When The DTC Sets

- The TCM will flash the Power Lamp after two consecutive trips with a failure reported.
- Freeze shift adapts from being updated.
- TCM assumes D4 shift pattern.
- Elevate line pressure.
- TCM inhibits TCC engagement.
- DTC P1810 will be stored in TCM memory.

Conditions For Clearing the DTC

Condition 1

- Engine running.
- The TFP Val. Position Sw. does not detect an illegal range for 5 seconds, three consecutive ignition cycles.

Condition 2

- When the following is true for three consecutive ignition cycles.
  - System voltage is 10-17 volts.
  - No VSS DTC(s) P0722 or P0723.
  - Vehicle speed less than 11 km/h (7 mph).
  - TFP Val. Position Sw. indicates park or neutral for 3 seconds.

Condition 3

- After three consecutive ignition cycles when the following is true:
  - TFP Val. Position Sw. indicates P (Park) or N (Neutral) when ratio is greater than 0.72 for 5 seconds.
  - TFP Val. Position Sw. indicates Reverse when ratio is between 2.02 and 2.23 for 5 seconds.
  - TFP Val. Position Sw. indicates D or 3 or 2 or 1 when the ratio is less than 2.02 or greater than 2.23 for 5 seconds.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

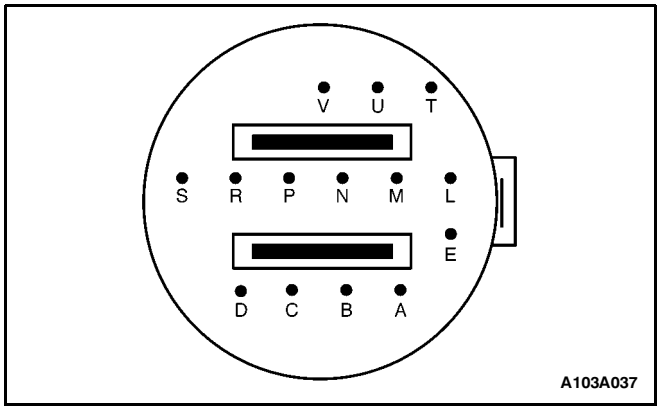
- A pressure regulator problem could possibly set DTC P1810.
- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

4. This step tests the TCM's ability to recognize an open circuit on signal "A", "B" and "C" ranges.

Gear Position	Range Signal A	Range Signal B	Range Signal c
Park	ON	OFF	OFF
Reverse	ON	OFF	ON
Neutral	ON	OFF	OFF
Drive/OD	ON	ON	OFF
D3/3rd	OFF	ON	OFF
D2/2nd	OFF	ON	ON
D1/Lo	ON	ON	ON
Illegal	OFF	OFF	OFF
Illegal	OFF	OFF	ON



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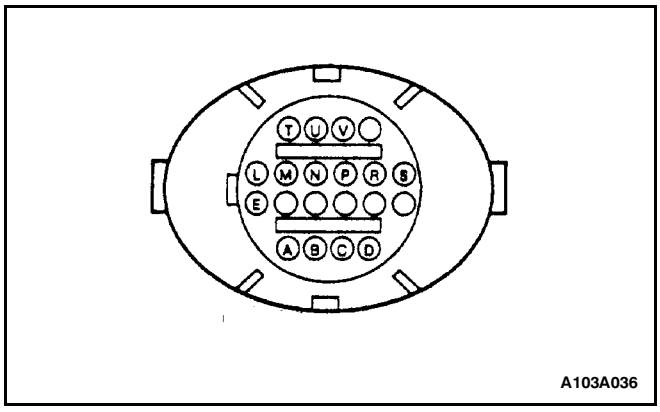

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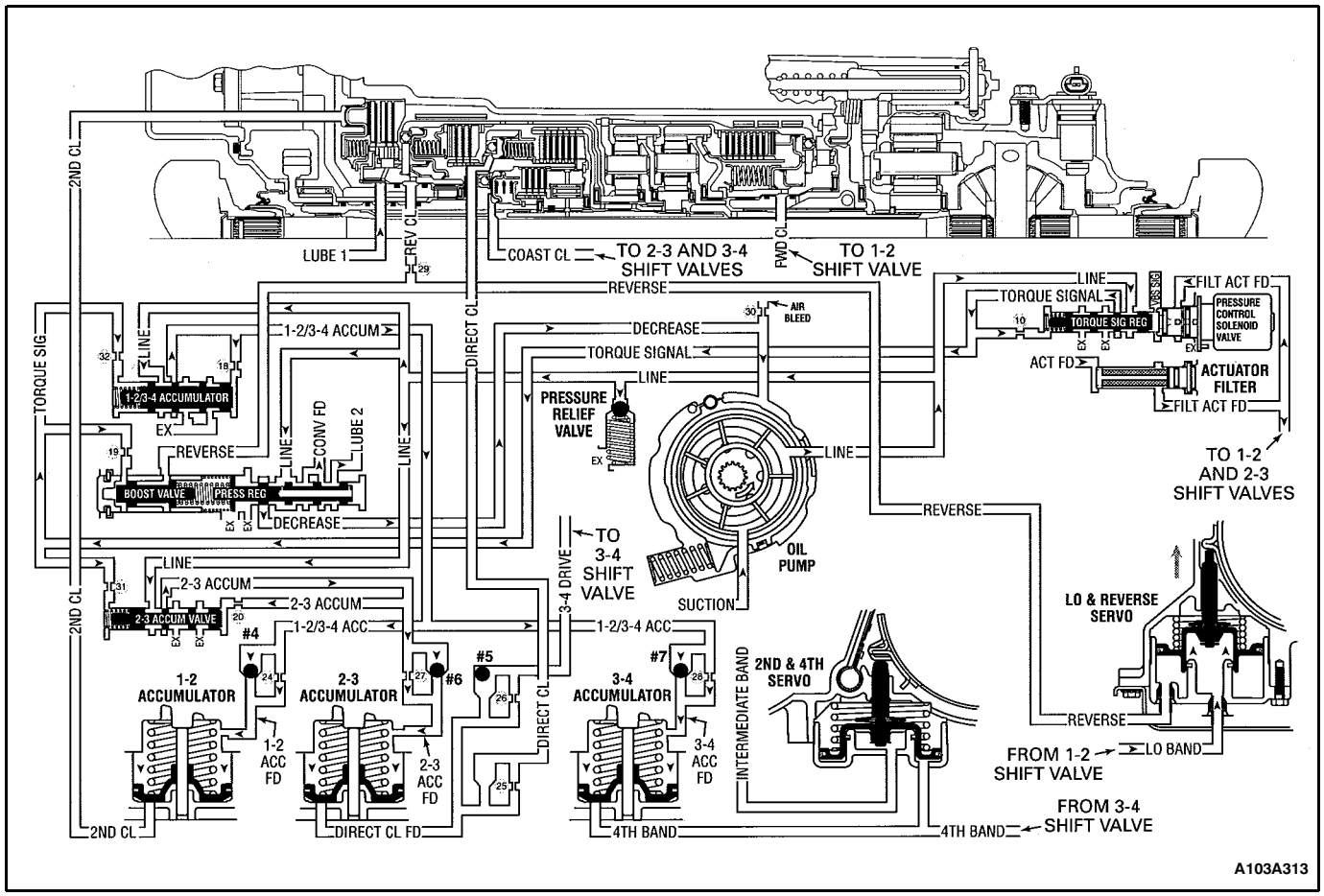
DTC P1810 - Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) Malfunction

Step	Action	Value(s)	Yes	No
1	Has the transmission fluid checking procedure been performed?	-	Go to Step 2	Go to Fluid Check Procedures
2	Check the transmission shift linkage for proper adjustment. Was the condition found and corrected?	-	Go to Step 28	Go to Step 3
3	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). 4. Apply the parking brake. 5. Engine running. 6. Apply the brakes and select each transmission range (P, R, N, 1, 2, 3, D), while monitoring scan tool. Refer to Gear Position and Range Signal Chart. Does each selected transmission range match scan tool and signal range chart?	-	Go to Diagnostic Aids	Go to Step 4
4	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. Ignition ON, engine OFF. Is the TFP Switch display as shown?	A B C OFF/OFF/OFF	Go to Step 11	Go to Step 5
5	Does the TFP Switch signal "A" display ON?	-	Go to Step 8	Go to Step 6
6	Does the TFP Switch signal "B" display ON?	-	Go to Step 9	Go to Step 7
7	Does the TFP Switch signal "C" display ON?	-	Go to Step 10	Go to Step 8
8	Check circuit 508 from the 20-way connector to TCM for a short to ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27
9	Check circuit 510 from the 20-way connector to TCM for a short ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27
10	Check circuit 509 from the 20-way connector to TCM for a short to ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27
11	Note: While performing Steps 11, 12, and 13, if two or more signal ranges display ON, those circuits will be shorted together. Using J 35616 Connector Test Adapter Kit, connect a fused jumper wire from terminal N to a good ground. (See Connector View.) Does the TFP Switch signal "A" display ON?	A ON	Go to Step 12	Go to Step 13
12	Connect a fused jumper wire from terminal R to a good ground. Does the TFP Switch signal "B" display ON?	B ON	Go to Step 13	Go to Step 15
13	Connect a fused jumper wire from terminal P to a good ground. Does the TFP Switch signal "C" display ON?	C ON	Go to Step 17	Go to Step 16
14	Check circuit 508 from the 20-way connector to TCM for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27

DTC P1810 - Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) Malfunction (Cont'd)

Step	Action	Value(s)	Yes	No
15	Check circuit 510 from the 20-way connector to TCM for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27
16	Check circuit 509 from the 20-way connector to TCM for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 27
17	1. Ignition OFF. 2. Using J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal N to a good ground. (See Transmission Connector View.) 3. Observe the ohmmeter display. Is the circuit resistance as shown?	u 1000 W	Go to Step 18	Go to Step 20
18	Connect an ohmmeter from terminal R to a good ground. Observe the ohmmeter display. Is the resistance as shown?	u 1000 W	Go to Step 19	Go to Step 21
19	Connect an ohmmeter from terminal P to a good ground. Observe the ohmmeter display. Is the resistance as shown?	u 1000 W	Go to Step 23	Go to Step 22
20	Check circuit 508 of the transmission harness for a short to ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
21	Check circuit 510 of the transmission harness for a short to ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
22	Check circuit 509 of the transmission harness for a short to ground. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
23	Check circuit 508 from the transmission 20-way connector to TFP Val. Position Sw. for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
24	Check circuit 510 from the transmission 20-way connector to TFP Val. Position Sw. for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
25	Check circuit 509 from the transmission 20-way connector to TFP Val. Position Sw. for an open. Was the condition found and corrected?	-	Go to Step 28	Go to Step 26
26	Replace the TFP Val. Position Sw. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) Replacement. Is the repair complete?	-	Go to Step 28	-
27	Replace the TCM. Is the replacement complete?	-	Go to Step 28	-
28	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



DIAGNOSTIC TROUBLE CODE (DTC) P1811 MAXIMUM ADAPT AND LONG SHIFT

Circuit Description

The transmission line pressure is modified by the TCM through the Pressure Control Solenoid Valve (PC Sol. Valve) to control the gear shift execution time and shift consistency. The TCM monitors various inputs and modifies the shift execution and timing by applying a calculated duty cycle to the PC Sol. Valve, the TCM alters the shifting based on driving habits, transmission load and internal transmission condition.

When the TCM detects long shifts that can not be shortened by shift adapts during the same ignition cycle, then DTC P1811 sets.

Conditions For Setting The DTC

- **Shift time is greater than 1 second at maximum adapt for a total four times per ignition cycle.**

Action Taken When The DTC Sets

- **TCM will NOT flash the Power Lamp.**
- **TCM will command maximum line pressure.**
- **TCM will freeze shift adapts from being updated.**
- **DTC P1811 will be stored in TCM memory.**

Conditions For Clearing The DTC

- **After each ignition cycle without the fault condition present.**
- **To cancel DTC fail actions, the fault must no longer exist and the ignition must be cycled off for five seconds.**
- **History DTC(s) can be cleared by using a Scan Tool.**

Diagnostic Aids

- **Question the owner for the possibility of vehicle overloading, exceeding trailer towing limit, or towing in overdrive.**
- **If after several attempts to gain accurate shift times and an adapt can be made, reset adapts and operate vehicle to assure proper shifting.**

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. **This step checks for possible low fluid level causing delayed shift(s).**
4. **This step checks for possible low line pressure causing delayed shift(s).**

DTC P1811 - Maximum Adapt and Long Shift

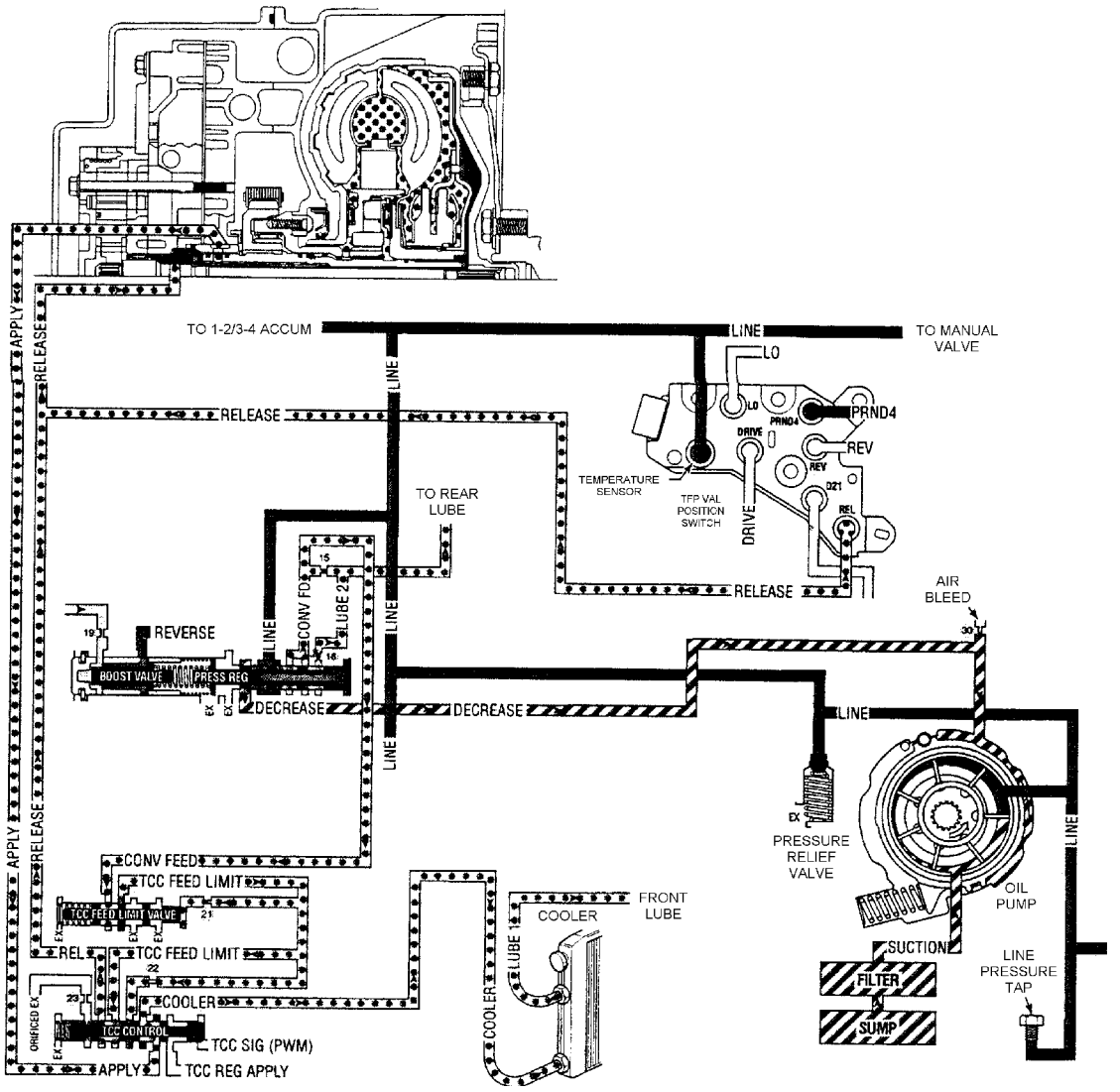
Step	Action	Value(s)	Yes	No
1	Has the transmission fluid checking procedure been performed?	-	Go to Step 2	Go to Transmission Fluid Check
2	1. Install the scan tool. 2. Ignition ON, engine OFF. 3. Record then clear DTC(s). 4. Drive the vehicle in D to obtain a 1-2, 2-3, and 3-4 upshifts. 5. With the scan tool, record 1-2, 2-3, 3-4 shift times. Did all shifts exceed time shown?	u 1 second	Go to Step 3	Go to Step 5
3	Perform the line pressure check. Was the line pressure within specifications?	-	Go to Diagnostic Aids	Go to Step 4
4	Inspect the transmission for: • Low fluid level caused by external leaks • Clogged fuel filter • Out-of-position fluid filter • Internal fluid passage leaks • Casting porosity or damage • Damaged gasket or spacer plate • Out-of-position gasket or spacer plate • Contaminated PC Sol. Valve • Damaged PC Sol. Valve • Stuck PC Sol. Valve • Stuck pressure regulator valve train • Leaking pressure regulator valve train • Stuck torque signal valve train • Leaking torque signal valve train • Leaking oil pump • Damaged oil pump • Inadequate oil pump suction • Oil pump cavitation. Was the condition found and corrected?	-	Go to Step 10	-
5	Did 1-2 shift exceed time shown?	u 1 second	Go to Step 8	Go to Step 6
6	Did 2-3 shift exceed time shown?	u 1 second	Go to Step 9	Go to Step 7
7	Did 3-4 shift exceed time shown?	u 1 second	Go to Step 10	-

DTC P1811 - Maximum Adapt and Long Shift (Cont'd)

Step	Action	Value(s)	Yes	No
8	Inspect the 1-2 shift circuit for the following conditions: • Leaking 1-2 accumulator piston seals • Rolled 1-2 accumulator piston seals • Cut 1-2 accumulator piston seals • Leaking 2nd clutch piston seals • Rolled 2nd clutch piston seals • Cut 2nd clutch piston seals • Burned 2nd clutch plates • Damaged 2nd clutch plates • Broken 2nd clutch springs • Out-of-position 2nd clutch springs • Damaged 2nd clutch piston • Leaking driven sprocket support seals • Damaged driven sprocket support seals • Internal fluid passage leaks • Casting porosity or damage • Damaged gasket or spacer plate • Out-of-position gasket or spacer plate • Slipping forward clutch • Cracked or damaged driven sprocket support • Damaged sprag clutch (not holding) • 2nd roller clutch damaged (not holding) Was the condition found and corrected?	-	Go to Step 11	-
9	Inspect the 2-3 shift circuit for the following conditions: • Leaking 2-3 accumulator piston seals • Rolled 2-3 accumulator piston seals • Cut 2-3 accumulator piston seals • Leaking direct clutch piston seals • Rolled direct clutch piston seals • Cut direct clutch piston seals • Burned direct clutch plates • Damaged direct clutch plates • Broken direct clutch springs • Out-of-position direct clutch springs • Damaged direct clutch piston • Leaking driven sprocket support seals • Damaged driven sprocket support seals • Damaged driven sprocket support • Damaged (or not holding) sprag clutch • Internal fluid passage leaks • Casting porosity or damage • Damaged gasket or spacer plate • Out-of-position gasket or spacer plate Was the condition found and corrected?	-	Go to Step 11	-

DTC P1811 - Maximum Adapt and Long Shift (Cont'd)

Step	Action	Value(s)	Yes	No
10	Inspect the 3-4 shift circuit for the following conditions: • Leaking 3-4 accumulator piston seals • Rolled 3-4 accumulator piston seals • Cut 3-4 accumulator piston seals • Leaking intermediate/4th servo piston seals • Rolled intermediate/4th servo piston seals • Cut intermediate/4th servo piston seals • Burned intermediate/4th band • Out-of-position intermediate/4th band • Damaged intermediate/4th band • Slipping intermediate/4th band • Internal fluid passage leaks • Casting porosity or damage • Damaged gasket or spacer plate • Out-of-position gasket or spacer plate • Slipping direct clutch • Damaged intermediate/4th servo pin • Seized intermediate/4th servo pin • Damaged intermediate/4th servo piston • Cracked intermediate/4th servo cover • Leaking intermediate/4th servo cover Was the condition found and corrected?	-	Go to Step 11	-
11	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart



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DIAGNOSTIC TROUBLE CODE (DTC) P1814
TORQUE CONVERTER OVERSTRESS

Circuit Description

This diagnostic checks for unusually high throttle angle and torque converter slip speed when the transmission is in a drive range. Sustained high torque converter slip speeds will generate excessive heat build-up in the transmission fluid. Operating the vehicle under these conditions is unsafe and will damage the powertrain. When the transmission fluid becomes overheated, it is less effective at providing cooling, lubrication, and cleaning of the transmission components.

When the TCM detects high throttle angle with high torque converter slip then DTC P1814 will set.

Conditions For Setting The DTC

- **No TP DTC P1791.**
- **No VSS DTCs P0722 or P0723 are set.**
- **No TFP Val. Position Sw. DTC P1810 is set.**
- **Transmission output speed is less than 1500 rpm.**
- **The transmission is in Drive or Reverse.**
- **The throttle angle is greater than 50%.**
- **The TCC slip speed is greater than 1500 rpm for 8 seconds.**

Action Taken When The DTC Is Set

- DTC P1814 will be stored in TCM memory.

Conditions For Clearing The DTC

- When the TCC slip speed is less than 1450 rpm.
- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

A simultaneous acceleration and application of the brakes may cause the DTC to occur.

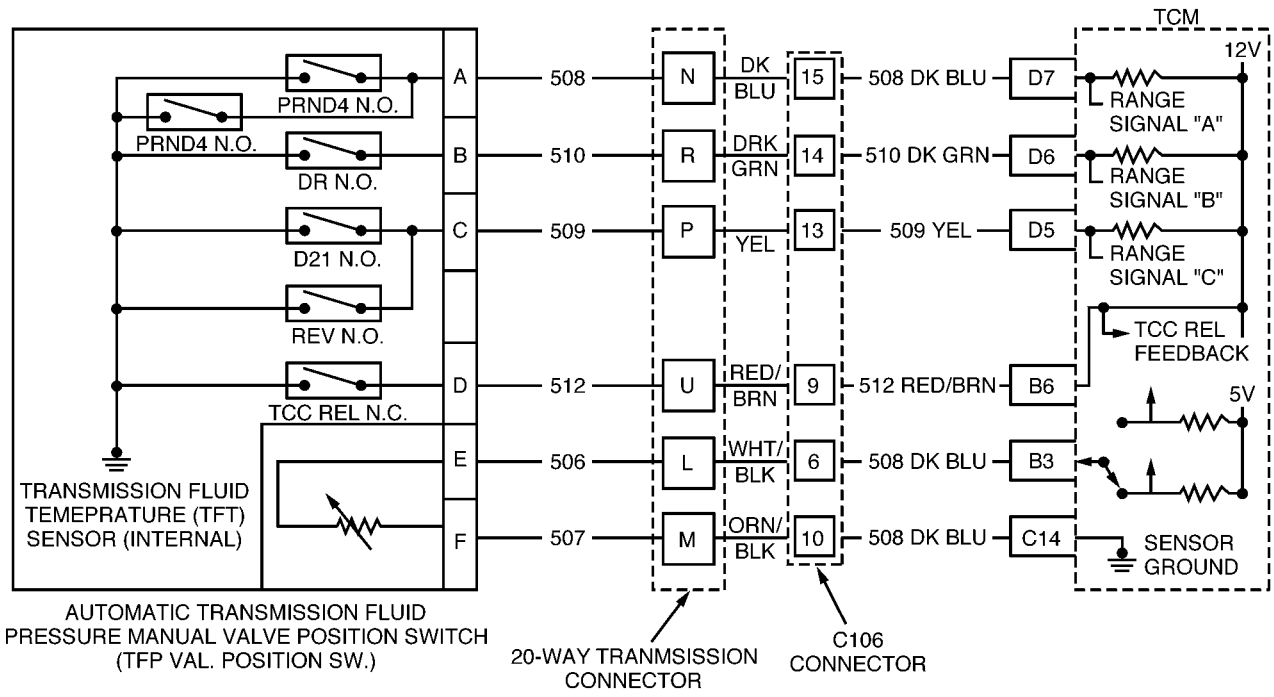
Test Description

The numbers below refer to the step numbers on the diagnostic chart.

1. This step inspects the fluid level and condition. If the fluid condition is suspect, replace the fluid.
3. This step replaces the transmission fluid and filter, and flushes the transmission cooler.

DTC P1814 - Torque Converter Overstress

Step	Action	Value(s)	Yes	No
1	Inspect the transmission fluid level and condition. Is the insepction complete?	-	Go to Step 2	Go to Fluid Checking Procedures
2	Is the transmission fluid dark brown in color and have a burnt odor?	-	Go to Step 3	Go to Step 4
3	Replace the transmission fluid and filter. Flush the transmission cooler. Refer to Changing Oil and Filter. Refer to Transmission Cooler Flush. Are the procedures complete?	-	Go to Step 4	-
4	Advise the customer that overloading the vehicle, exceeding the trailer-towing limit, towing in Overdrive, or simultaneous acceleration and application of the brakes can damage the powertrain.	-	Repair verified, exit DTC Chart	-



DIAGNOSTIC TROUBLE CODE (DTC) P1887
TCC RELEASE SWITCH CIRCUIT MALFUNCTION

Circuit Description

The Torque Converter Clutch (TCC) release switch is part of the Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.) that is mounted to the transmission valve body. The switch is a normally closed switch. The purpose of the switch is to provide a signal to the Transmission Control Module (TCM) that the TCC is released. This is accomplished by Torque Converter release fluid pressure acting on the switch contact and opening the circuit. When the voltage is high on circuit 512, the TCM recognizes that the TCC is no longer engaged.

When the TCM detects the TCC release switch is open indicating TCC is not applied and TCC slip speed indicate the TCC is engaged, then DTC P1887 sets.

Conditions For Setting The DTC

- **No Input Speed Sensor DTCs P0716 or P0717.**
- **No TCC stuck Off DTC P0741.**
- **No TCC stuck On DTC P0742.**
- **Engine running.**
- **Transmission is in D4.**
- **TCC commanded On.**
- **TCC slip speed is between -20 RPM and 20 RPM.**
- **TCC release switch is open.**
- **All above conditions met for 8 seconds.**

Action Taken When The DTC Is Set

- **TCM will flash the Power Lamp after two consecutive trips with a failure reported.**
- **Freeze shift adapts from being updated.**
- **TCM inhibits TCC engagement.**
- **DTC P1887 will be stored in TCM memory.**

Conditions For Clearing The DTC

- **When the following is true for three consecutive ignition cycles and:**
  - **No Input Speed Sensor DTCs P0716 or P0717.**
  - **No TCC stuck Off DTC P0741.**
  - **No TCC stuck On DTC P0742.**
  - **Engine is running.**
  - **Transmission is in D4.**
  - **TCC is commanded ON.**

- TCC slip speed is between -20 RPM and 20 RPM.
- TCC Release Switch is closed.
- All above conditions are met for 8 seconds.

- History DTC(s) can be cleared by using a Scan Tool.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and at the transmission 20-way connector. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for chafed wires that could short to bare metal or other wiring. Inspect for broken wire inside the insulation.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing test equipment for a change.

Test Description

The numbers below refer to the step numbers on the diagnostic chart.

4. This Step tests the TCM's ability to recognize an open circuit.
5. This Step tests the TCM's ability to recognize a grounded circuit.

DTC P1887 - TCC Release Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	1. Install the scan tool. 2. With the engine OFF, turn the ignition switch to the ON position. 3. Record then clear DTC(s). 4. Select scan tool TCC Release Switch. Is the TCC Release Switch status as shown?	Closed	Go to Step 2	Go to Step 4
2	Start the engine. Is the TCC Release Switch status as shown?	Open	Go to Step 13	Go to Step 3
3	1. Ignition OFF. 2. Disconnect the transmission 20-way connector (additional DTC(s) will set). 3. With the engine OFF, turn the ignition switch to the ON position. Is the TCC Release Switch status as shown?	Open	Go to Step 7	Go to Step 6
4	1. Install the J 39775 Jumper Harness to the engine 20-way connector. 2. Using the J 35616 Connector Test Adapter Kit, connect a fused jumper from terminal U to a good ground. Is the TCC Release Switch status as shown?	Closed	Go to Step 7	Go to Step 5
5	Inspect circuit 512 for an open. Was the condition found and corrected?	-	Go to Step 14	Go to Step 12
6	Inspect circuit 512 for a short to ground. Was the condition found and corrected?	-	Go to Step 14	Go to Step 12
7	1. IDisconnect the J 39775 Jumper Harness from the engine 20-way connector. 2. Install the J 39775 Jumper Harness to the transmission 20-way connector. 3. Using the J 35616 Connector Test Adapter Kit, connect an ohmmeter from terminal U to a good ground. Is the resistance less than the specified value?	50 W	Go to Step 8	Go to Step 9
8	Start the engine. Is the resistance greater than the specified value?	50 W	Go to Step 9	Go to Step 10
9	Inspect circuit 512 of the internal wiring harness for an open. Was the condition found and corrected?	-	Go to Step 14	Go to Step 11

7DTC P1887 - TCC Release Switch Circuit Malfunction (Cont'd)

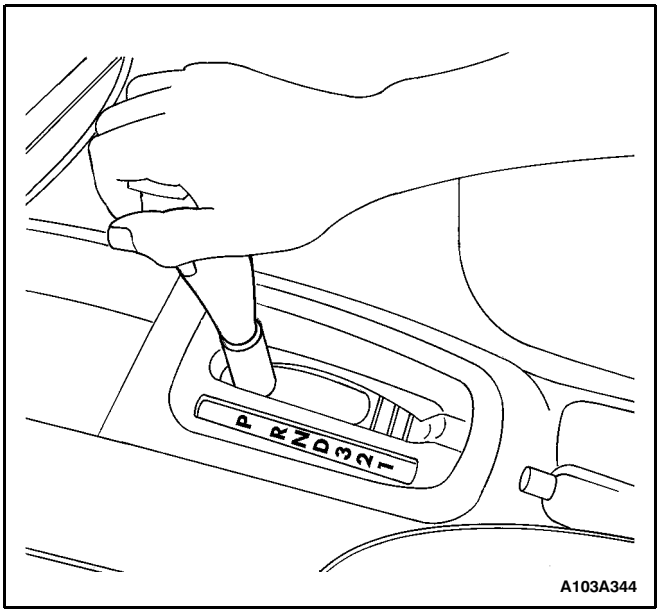
Step	Action	Value(s)	Yes	No
10	Inspect circuit 512 of the internal wiring harness for a short to ground. Was the condition found and corrected?	-	Go to Step 14	Go to Step 11
11	Replace the TFP Val. Position Sw. Refer to Automatic Transmission Fluid Pressure Manual Valve Position Switch Replacement. Is the replacement complete?	-	Go to Step 14	-
12	Replace the TCM. Refer to TCM Replacement. Is the replacement complete?	-	Go to Step 14	-
13	Inspect for the following conditions: • Leaking torque converter O-ring seal (41). Refer to Case and Associated Parts in Automatic Transmission Component Location. • Cut torque converter O-ring seal (41). • Debris or flash blocking the channel plate (27). Refer to Case and Associated Parts in Automatic Transmission Component Location at the TCC release exhaust passage (48), refer to Channel Plate Passages in Automatic Transmission Component Location. • Leaking oil pump bearing and seal assembly (200) seal. Refer to Oil Pump Assembly in Automatic Transmission Component Location. • Cut oil pump bearing and seal assembly (200) seal. • Oil pump bearing and seal assembly (200) installed backward. • Misaligned valve body-to-spacer plate gasket (22). Refer to Case and Associated Parts in Automatic Transmission Component Location. • Misaligned spacer plate-to-channel plate gasket (24). • Channel plate (27) turbine shaft sleeve installed backward or with no press fit. • Valve body spacer plate (23), refer to Case and Associated Parts in Automatic Transmission Component Location or release exhaust orifice (46), refer to Channel Plate Passages in Automatic Transmission Component Location blocked by debris, valve body-to-spacer plate gasket (22) or spacer plate-to-channel plate gasket (24). • Cut turbine shaft-to-sprocket seal (33). Refer to Case and Associated Parts in Automatic Transmission Component Location. • Missing turbine shaft-to-sprocket seal (33). Was the condition found and corrected?	-	Go to Step 14	-
14	1. After the repair is complete, select scan tool "Clear Info" function and road test the vehicle. 2. Review the "DTC Info". Has the last test failed or is the current DTC displayed?	-	Begin Diagnosis again	Repair verified, exit DTC Chart

MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

TRANSAXLE FLUID LEVEL CHECKING PROCEDURE

1. Start the engine and allow the engine to idle for approximately 5 minutes, or, if possible, drive the vehicle for a few miles to warm the transaxle fluid. Check the fluid level when the transaxle is above 40°C (104°F).
2. Park the vehicle on a hoist, inspection pit, or similar raised-level surface. The vehicle must be level to obtain a correct fluid level measurement.
3. Place a fluid container below the fluid level plug.



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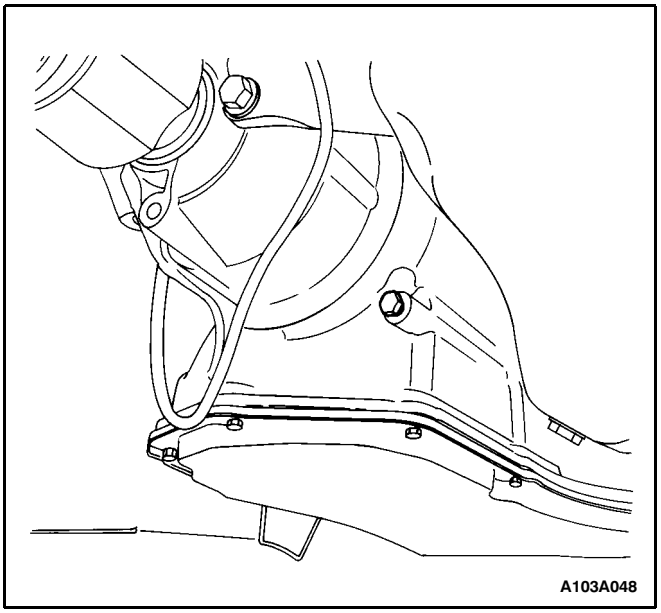
4. Press the brake pedal and move the shift lever through the gear ranges, pausing a few seconds in each range. Return the shift lever to the PARK position. (Left-Hand Drive Shown, Right-Hand Drive Similar.)


A103A048

Caution: Do not remove the fluid level plug if the transaxle fluid is hot. This may cause injury if the fluid drains from the plug hole.

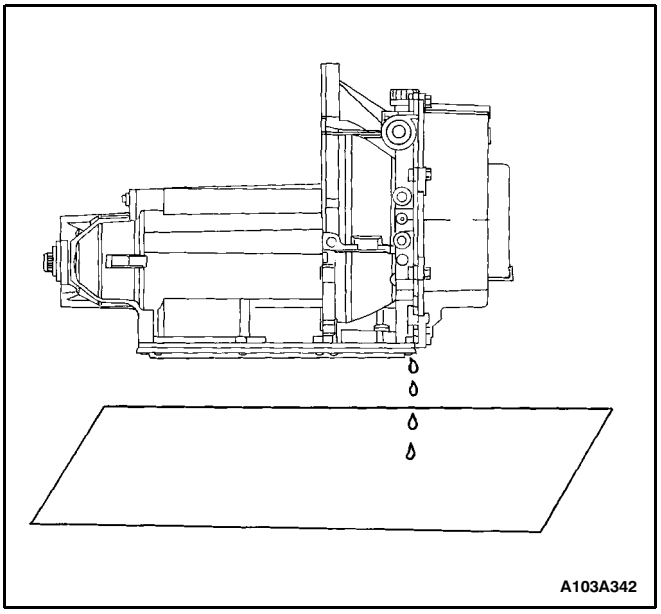
5. Remove the fluid level plug. Because the transaxle operates correctly over a range of fluid levels, fluid may or may not drain out of the plug hole when the plug is removed.
6. If fluid does not drain through the plug hole after adding a total of 1.5 liters, then the transaxle was either underfilled or the transaxle is leaking fluid. Inspect the transaxle for fluid leaks. Fix any leaks before setting the transaxle fluid level.
7. Install the fluid level plug.

   ### Tighten

   Tighten the fluid level plug to 12 N•m (106 lb-in).
8. When the fluid level checking procedure is completed, wipe any fluid from the transaxle case with a rag or shop towel. Also, check that the fluid fill cap and the vent tube are properly installed.

CHANGING THE FLUID

1. Disconnect the negative battery cable.
2. Remove the transaxle fluid filter and the filter seal. Refer to "Fluid Filter and Seal" in this section.
3. Flush the oil cooler. Refer to "Oil Cooler Flushing" in this section.
4. Install the transaxle fluid filter and the filter seal. Refer to "Fluid Filter and Seal" in this section.
5. Add transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
6. Connect the negative battery cable.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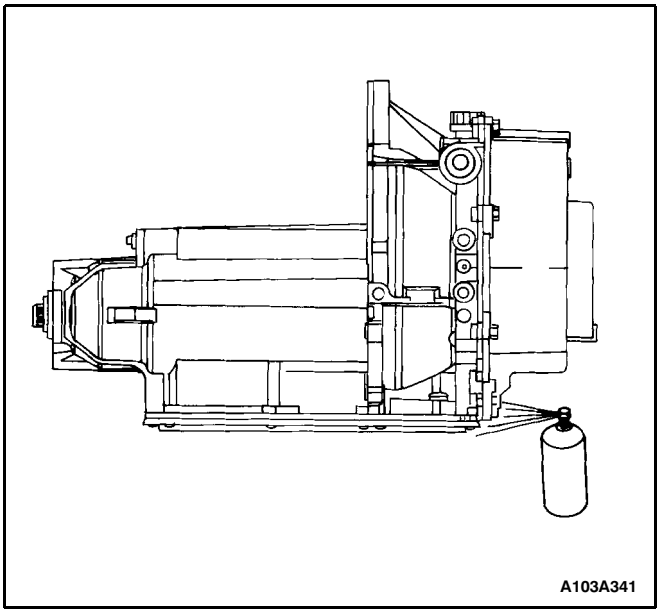
REPAIRING FLUID LEAKS

Locating Leaks

General Method

1. Verify that the leak is transaxle fluid.
2. Thoroughly clean the suspected leak area.
3. Operate the vehicle for about 15 miles or until the transaxle reaches normal operating temperature, 88°C (190°F).
4. Park the vehicle over clean paper or cardboard.
5. Shut the engine off and look for fluid spots on the paper.
6. Make the necessary repairs to correct the leak.


A103A341

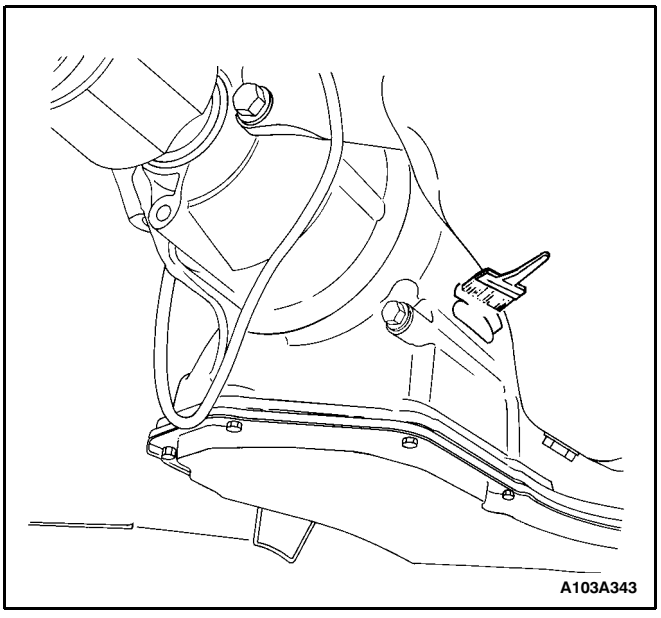
Powder Method

1. Thoroughly clean the suspected leak area.
2. Apply an aerosol-type powder (foot powder) to the suspected leak area.
3. Operate the vehicle for about 15 miles or until the transaxle reaches normal operating temperature, 88°C (190°F).
4. Shut the engine off.
5. Inspect the suspected leak area and trace the leak path through the powder to find the source of the leak.
6. Make the necessary repairs.

Repairing the Fluid Leak

The following are potential causes for fluid leaks. Check these and repair as necessary.

- **Fasteners are not tightened to specifications.**
- **Fastener threads and tapped holes are dirty or corroded.**
- **Gaskets, seals or sleeves are misaligned, damaged, or worn.**
- **The seal bore or the gasket surface is damaged, warped, or scratched.**
- **The manual shaft is nicked or damaged.**
- **There is a loose or worn bearing causing excess seal or sleeve wear.**
- **Case or component porosity.**
- **The fluid level is too high.**
- **There is a plugged vent or a damaged vent tube.**
- **There is water or coolant in the fluid.**
- **Fluid drain back holes are plugged.**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CASE POROSITY REPAIR

Caution: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

1. **Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.**
2. **Using instructions from the manufacturer, mix a sufficient amount of epoxy to make the repair.**
3. **While the transaxle case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also apply the epoxy cement. Make certain that the area to be repaired is fully covered.**
4. **Allow the epoxy cement to cure for 3 hours before starting the engine.**
5. **Repeat the fluid leak diagnosis procedures. Refer to "Fluid Leak Diagnosis and Repair" in this section.**

FLUID LEVEL SET AFTER SERVICE

1. Add transaxle fluid through the fill cap hole prior to adjusting the fluid level. The amount of fluid to add should be based on the type of service done. If the bottom pan was removed, add 7 liters (7.4 quarts). If a new torque converter was installed, add 2.5 liters (2.6 quarts). If a complete overhaul was done, refill the system with 10 liters (10.6 quarts). Use DEXRON[-III transaxle fluid only.
2. Check the transaxle fluid level. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
3. Add additional fluid through the fill cap hole in 0.5 liter increments until the fluid comes out through the plug hole.
4. Allow the fluid to finish draining out through the plug hole, then install the fluid level plug.

   ### Tighten

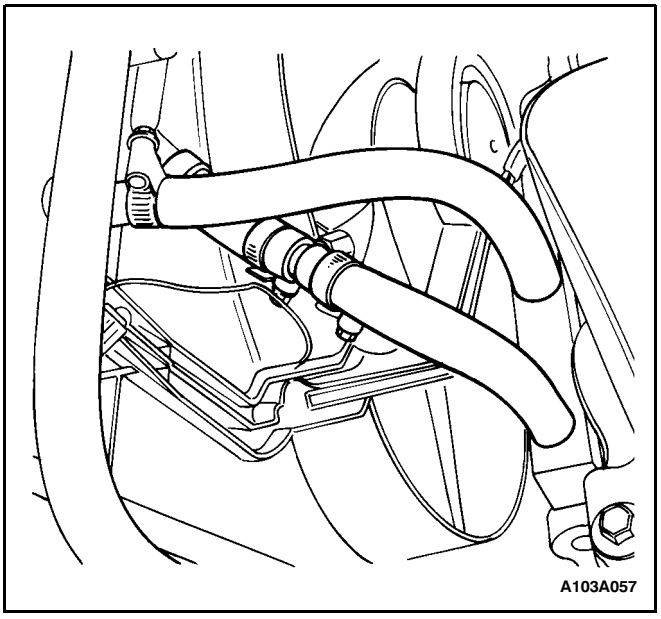
   Tighten the fluid level plug to 12 N•m (106 lb-in).
5. When the fluid level setting procedure is completed, wipe any fluid from the transaxle case with a rag or shop towel. Also, check that the fluid fill cap and the vent tube are properly installed.

OIL COOLER FLUSHING

1. Disconnect both cooler lines from the transaxle. Refer to "Oil Cooler Hoses" in this section.
2. Place a hose over the end of the cooler inlet line (from the top of the cooler) and insert the hose into an empty container.
3. Flush clean transaxle fluid through the return line (from the bottom of the cooler) using an oil suction gun until clean transaxle fluid comes out of the hose. This will back flush the cooler.

Important: If transmission fluid does not come out of the hose from the radiator, the cooler tubes within the radiator are damaged. The radiator should be repaired or replaced.

4. Remove the hose from the inlet cooler line and place it on the return line.
5. Flush clean transaxle fluid through the inlet line until clean transaxle fluid comes out of the return line. Remove the remaining transaxle fluid with compressed air. Flush with new transaxle fluid.
6. Reconnect the oil cooler lines to the transaxle. Refer to "Oil Cooler Hoses" in this section.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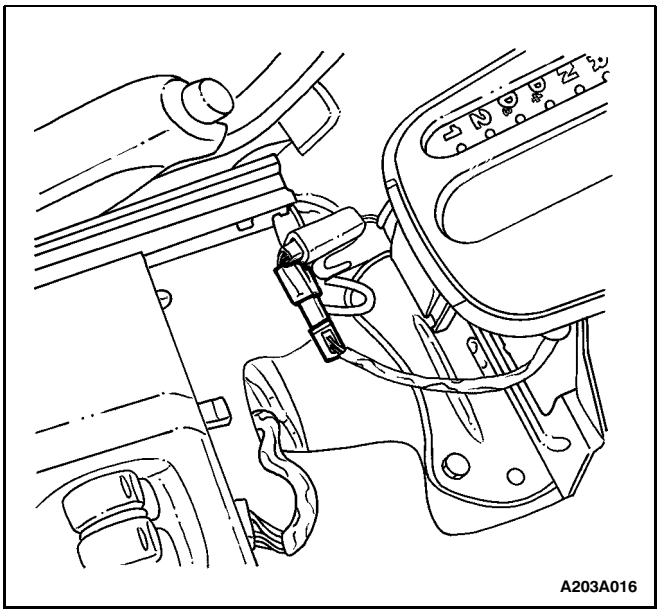
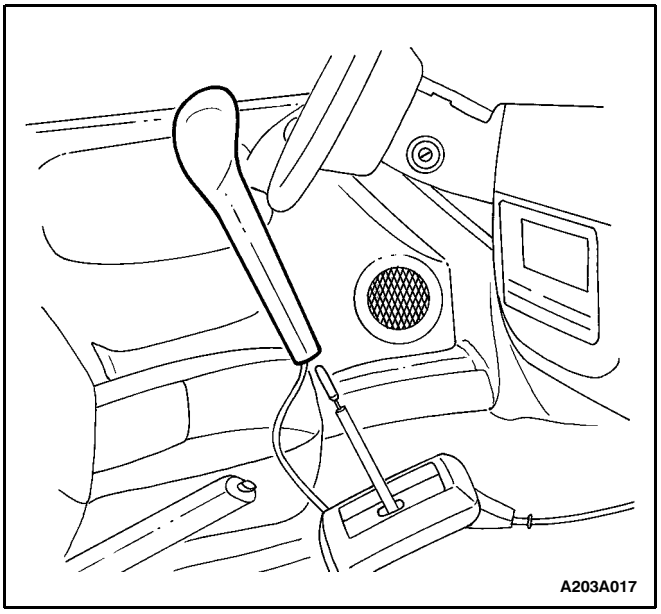


SHIFT CONTROL LEVER

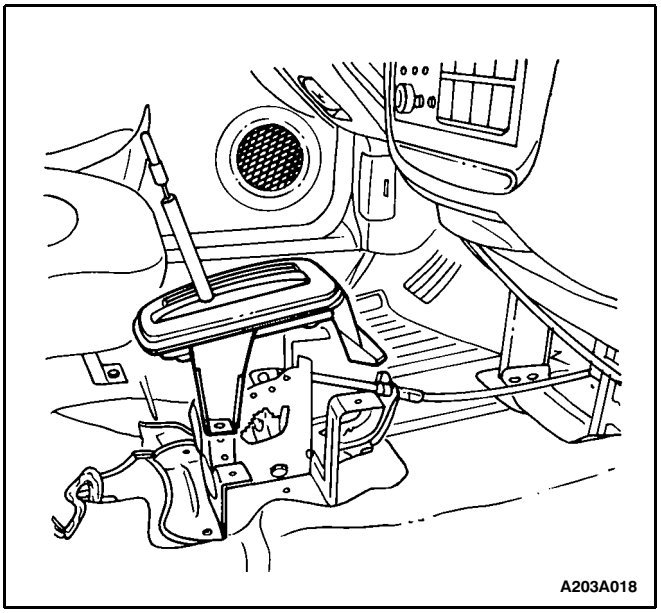
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Removal Procedure

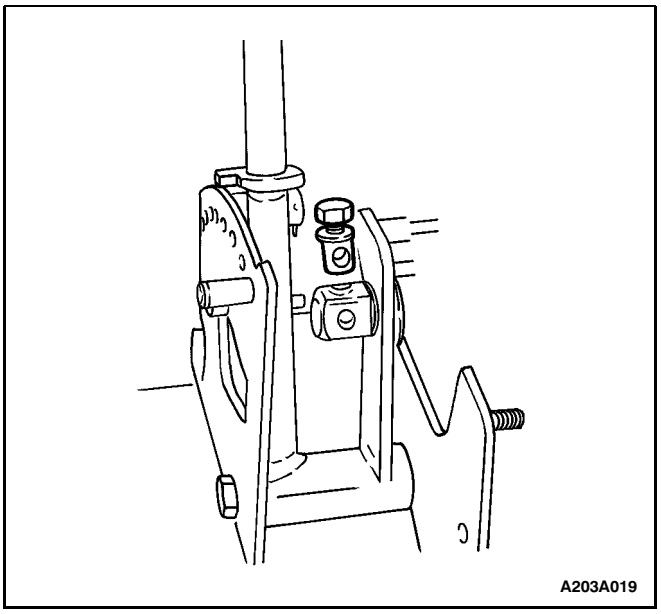
1. Disconnect the negative battery cable.
2. Remove the front part of the floor console. Refer to Section 9G, Interior Trim.
3. Disconnect the power mode switch electrical connection.



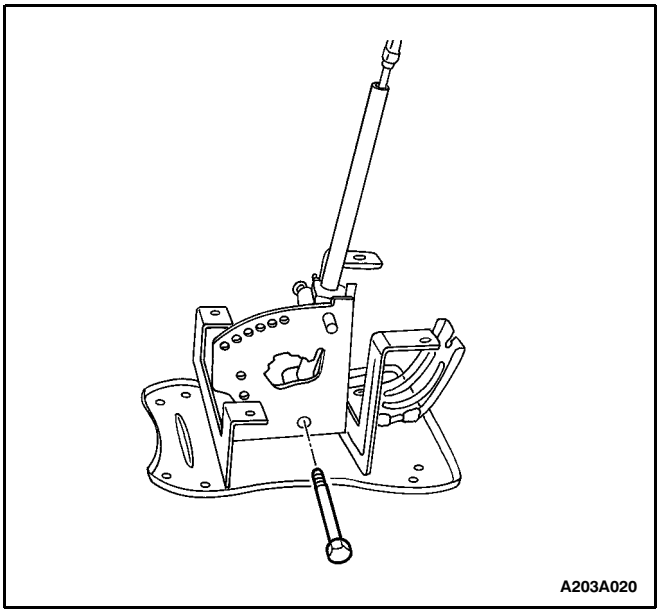
4. Remove the screws securing the shift control lever handle to the shift control lever. Remove the shift control lever handle.



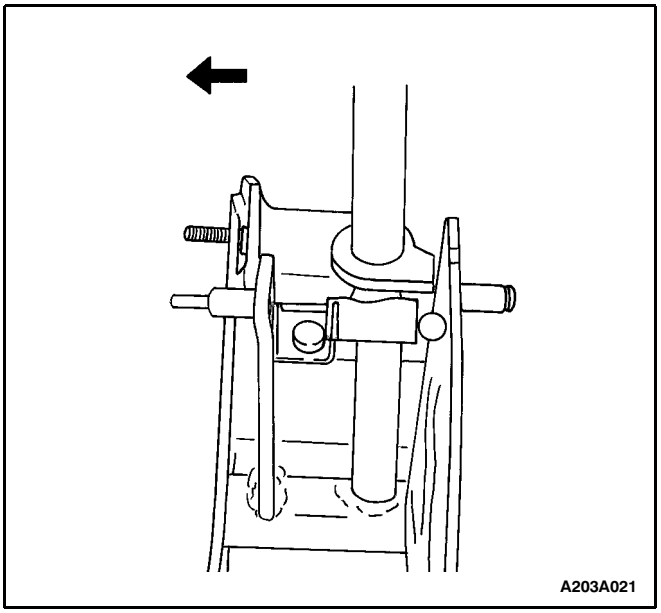
5. Remove the selector position indicator bracket.



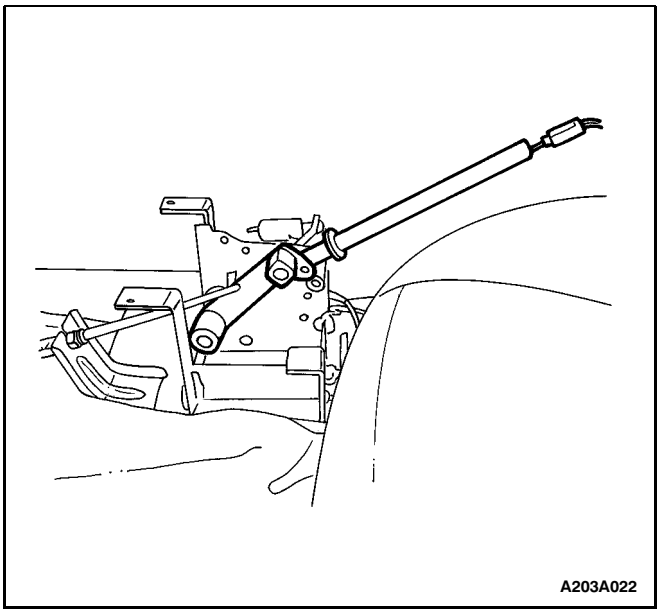
6. Slide the shift control cable out of the shift control cable adjuster and remove the pinch bolt assembly.



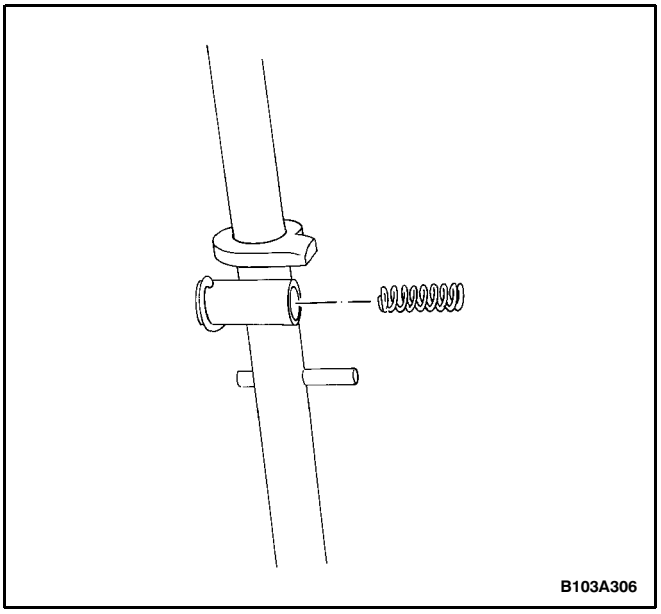
7. Remove the bolt from the bottom of the shift control lever.



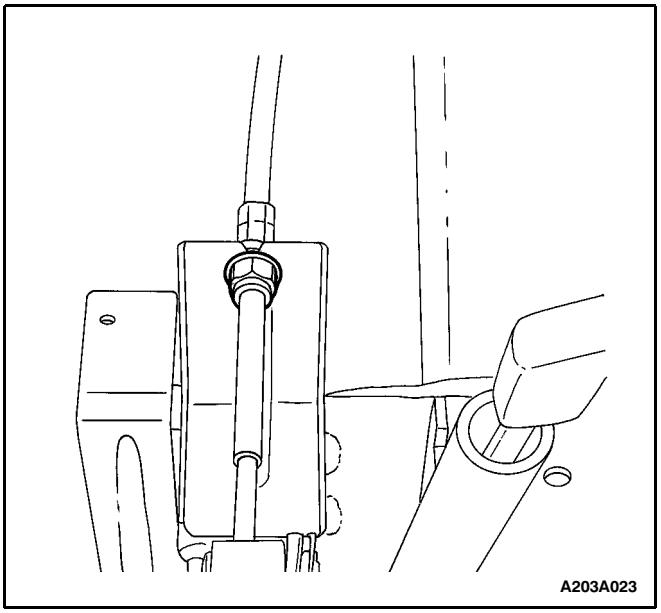
8. Tilt the shift control lever to the left side and remove the spring-loaded detent ball.



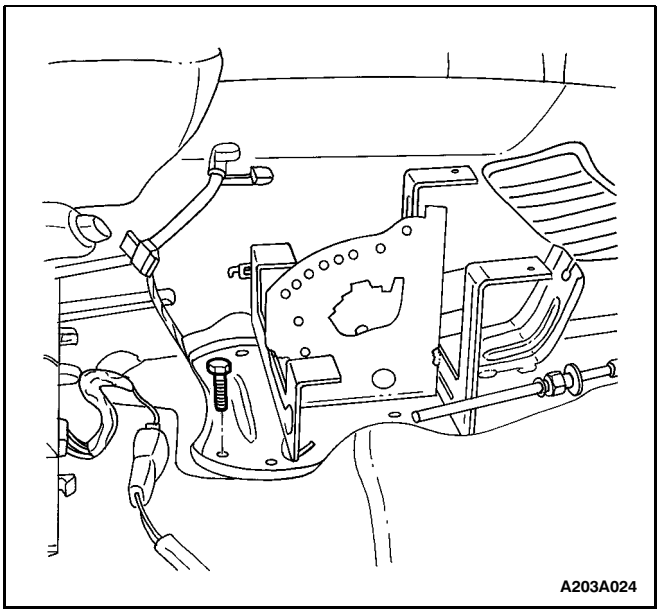
9. Remove the shift control lever by pressing the lock release shaft while pivoting the bottom of the shift control lever toward the front of the vehicle.



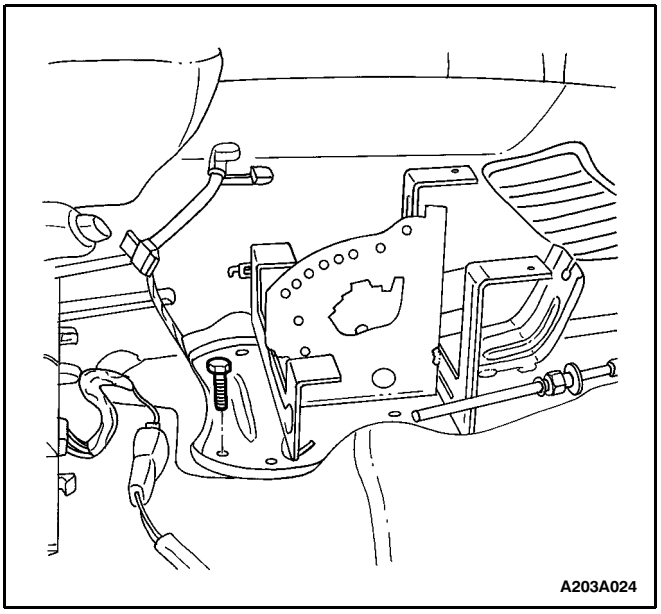
10. Slide the detent spring out of the shift control lever.



11. Loosen the shifter cable nut.
12. Remove the shift control cable from the shift control assembly.

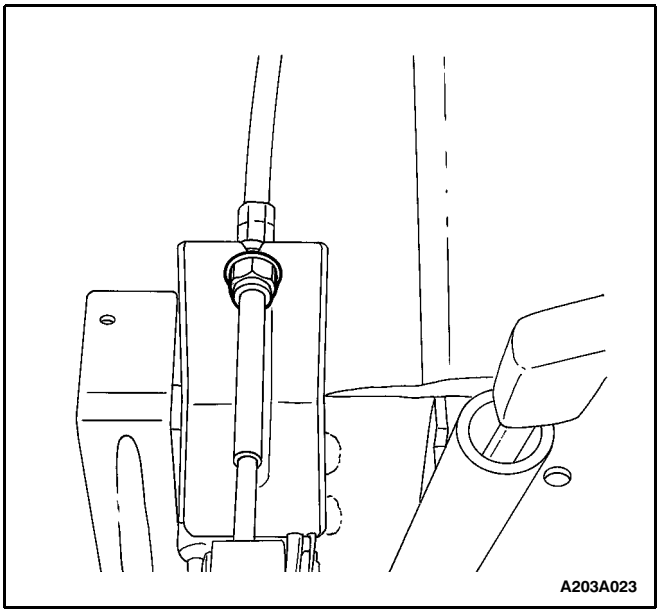

A203A024

12. Remove the bolts securing the shift control assembly to the floor panel.
13. Remove the shift control assembly.

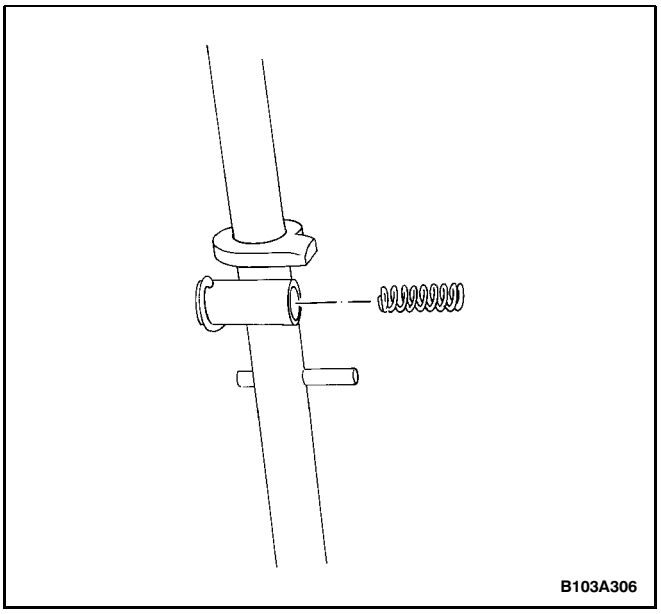

A203A024

Installation Procedure

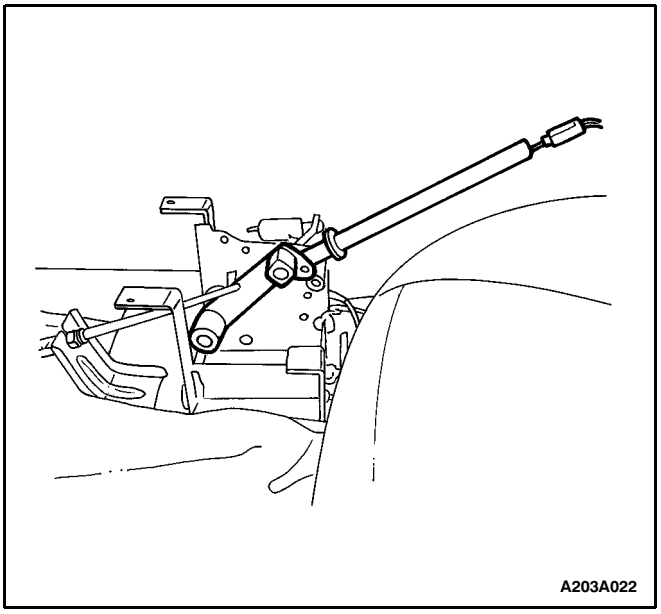
1. Install the shift control assembly to the floor panel with the bolts.


A203A023

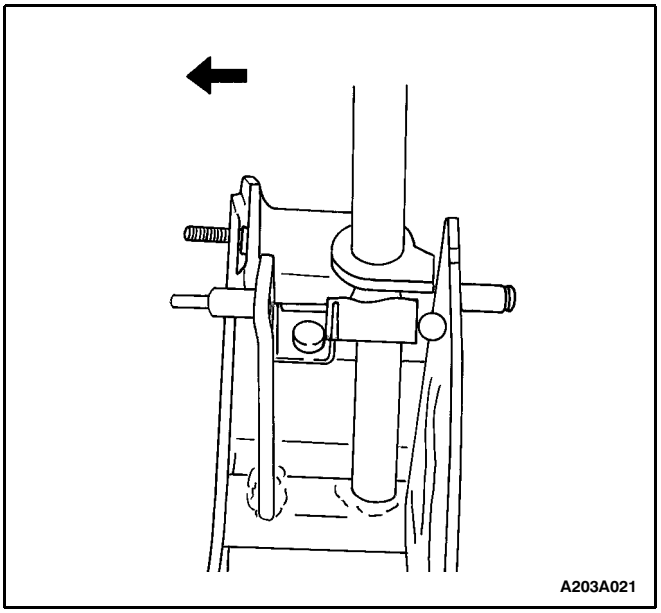
2. Install the shift control cable into the shift control assembly.
3. Tighten the shifter cable nut.


B103A306

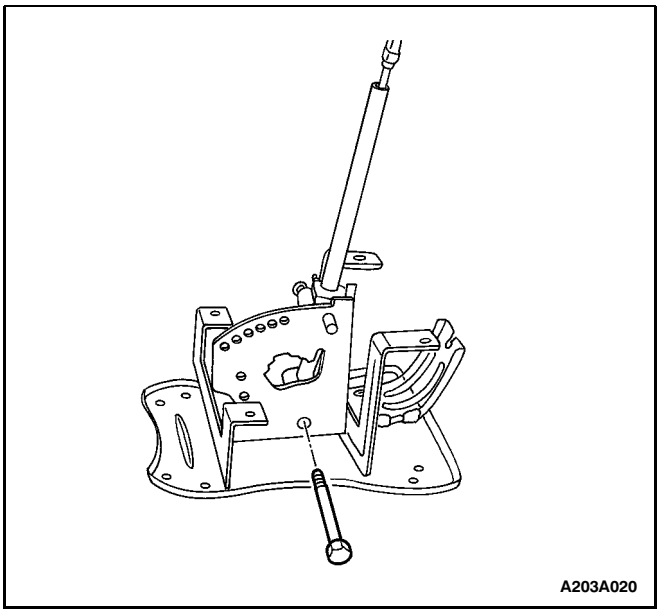
4. Install the detent spring into the shift control lever.


A203A022

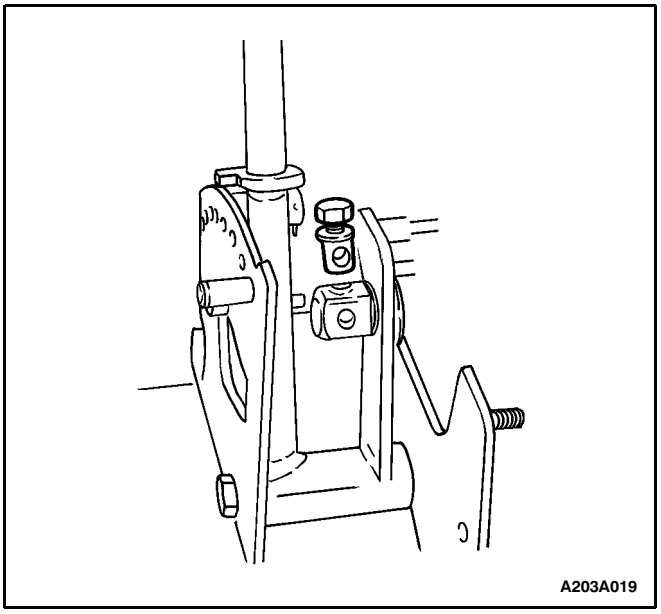
5. Install the shift control lever by pressing the lock release shaft while pivoting the bottom of the shift control lever toward the rear of the vehicle.


A203A021

6. Tilt the shift control lever to the left side and install the spring-loaded detent ball.


A203A020

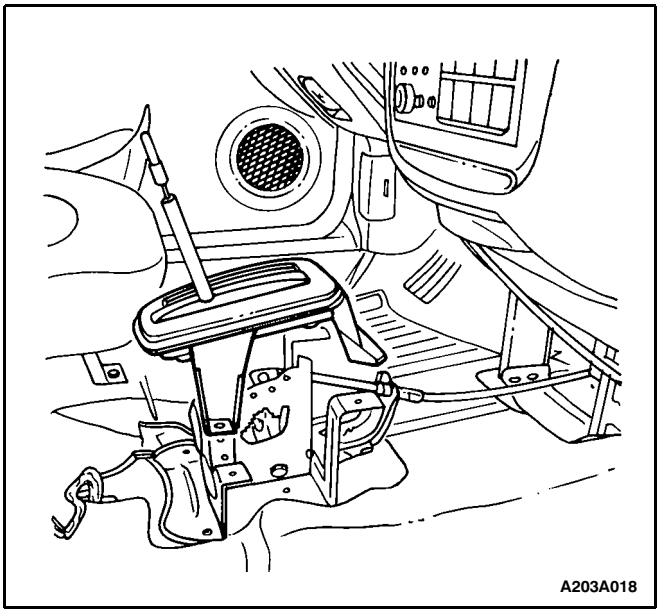
7. Install the bolt into the bottom of the shift control lever.


A203A019

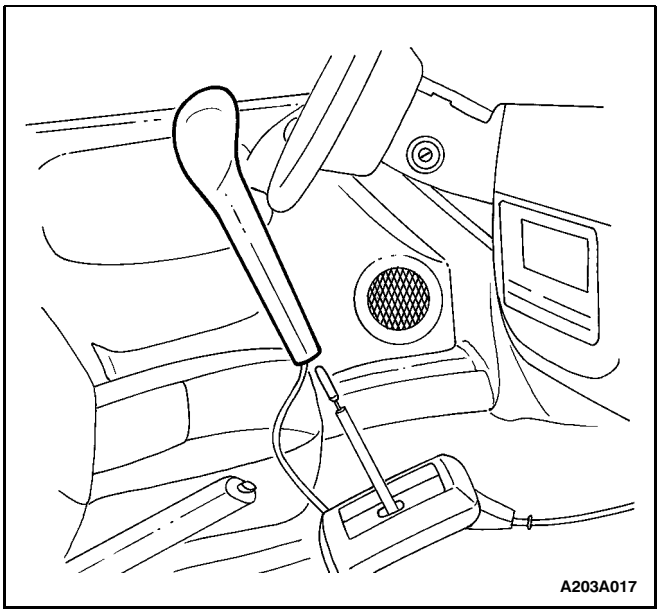
8. Install the pinch bolt assembly into the shift control cable adjuster and slide the shift control cable into the shift control cable adjuster. Refer to "Control Cable Adjustment" in this section.

Tighten

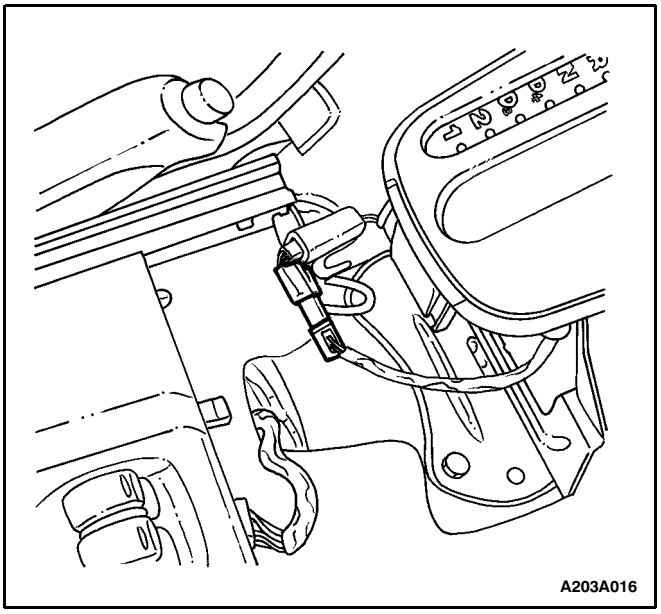
Tighten the shift control cable adjuster pinch bolt to 8 N•m (71 lb-in).


A203A018

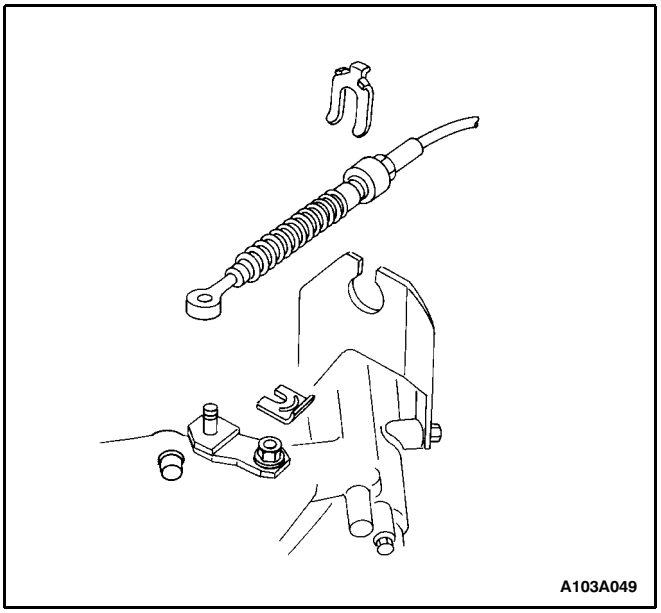
9. Install the selector position indicator bracket.


A203A017

10. Install the shift control lever handle. Install the two screws securing the shift control lever handle to the shift control lever.


A203A016

11. Connect the power mode switch electrical connection.
12. Install the front part of the center console. Refer to Section 9G, Interior Trim.
13. Connect the negative battery cable.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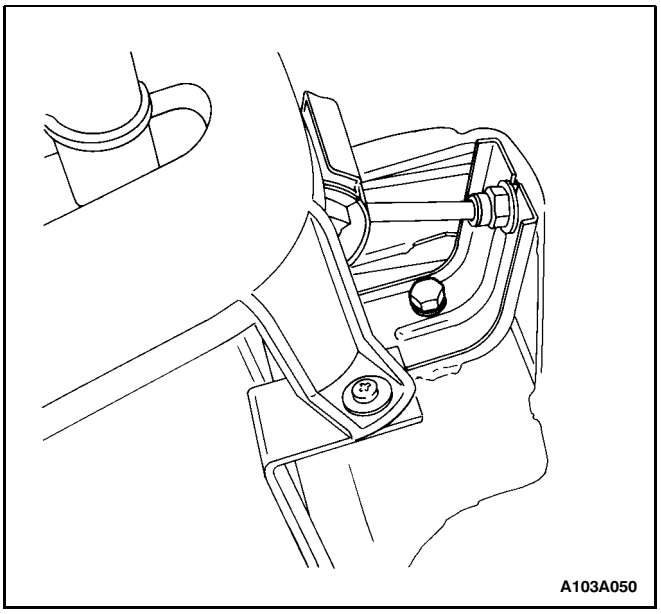
SHIFT CONTROL CABLE

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the shift control cable from the shift lever.
3. Disconnect the shift control cable from the bracket.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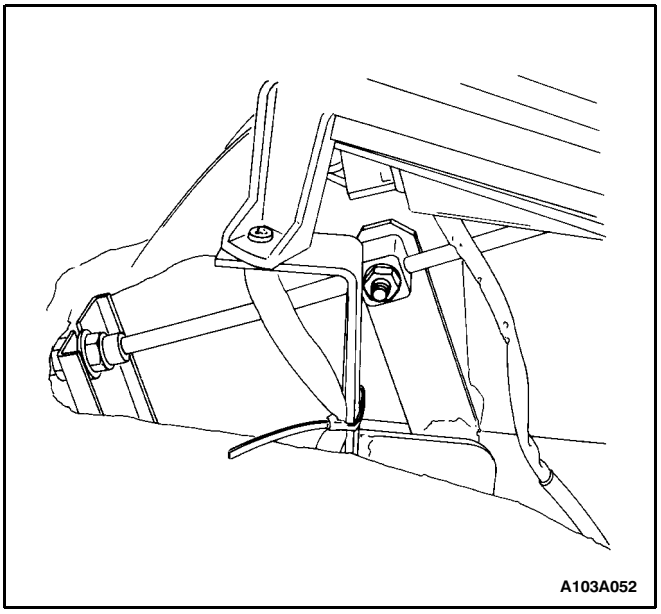
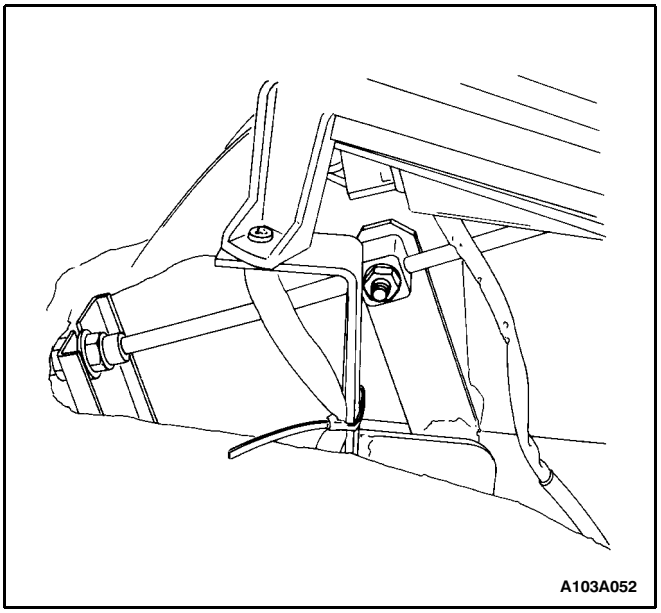
4. Remove the front part of the floor console. Refer to Section 9G, Interior Trim.
5. Loosen the floor bracket bolt.

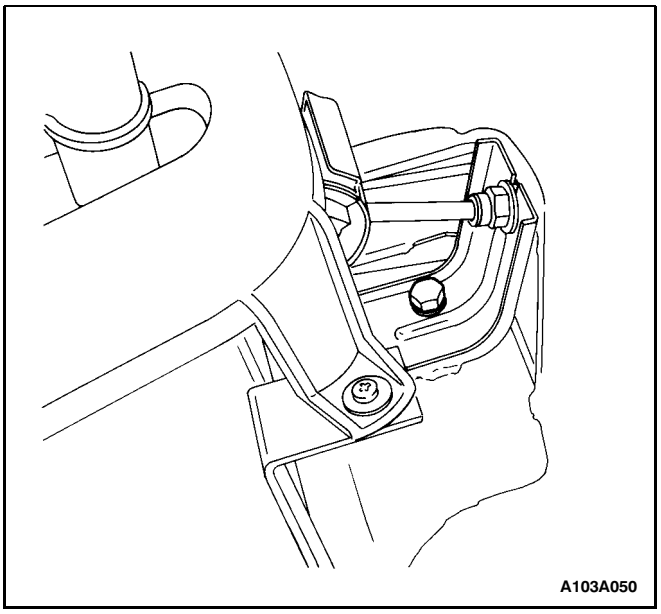

A103A052

6. Loosen the shifter cable nut.
7. Remove the shift control cable from the floor bracket and the shifter post.
8. Remove the shift control cable through the firewall.


A103A052

Installation Procedure

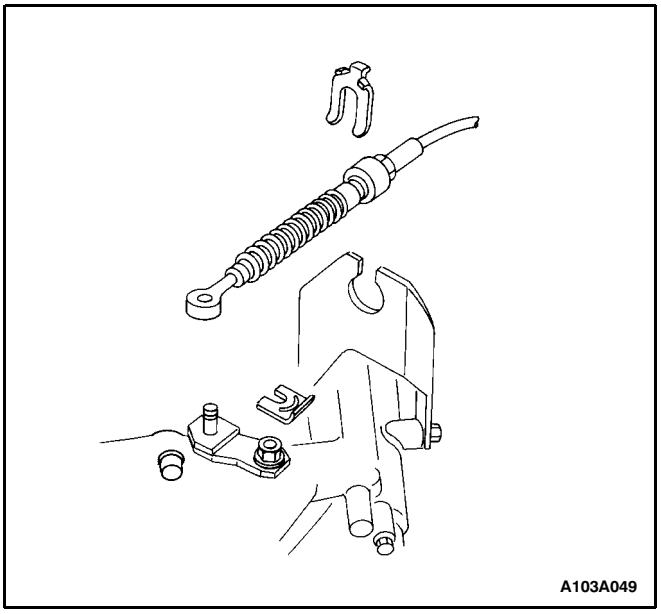
1. Install the shift control cable through the firewall.
2. Install the shift control cable through the floor bracket and the shifter post.
3. Tighten the shifter cable nut.



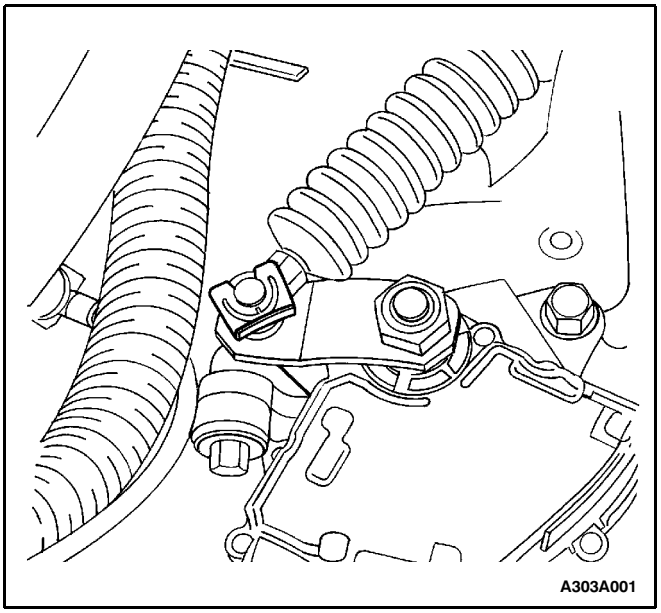
4. Tighten the floor bracket bolt.

Tighten

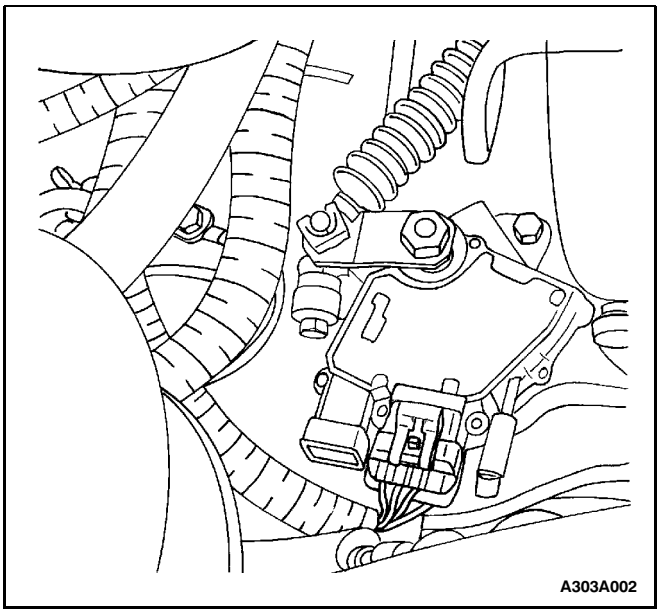
Tighten the floor bracket bolt to 8 N•m (71 lb-in).



5. Install the shift control cable into the engine compartment bracket and secure with the clip.

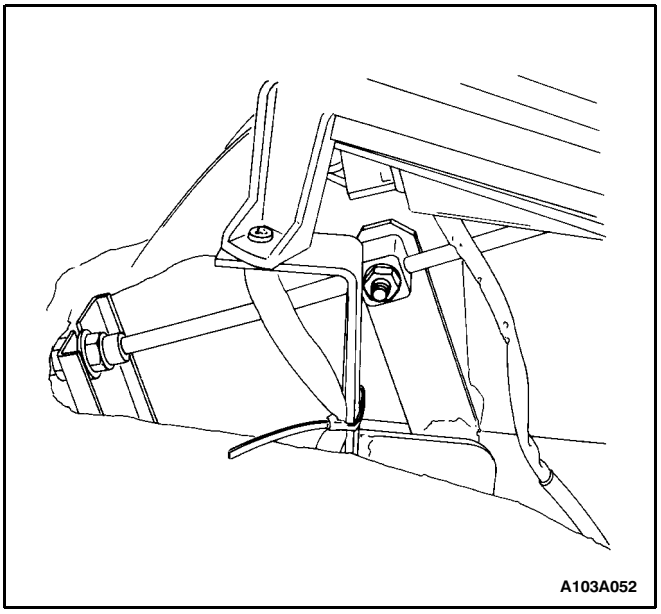


6. Install the front part of the floor console. Refer to Section 9G, Interior Trim.
7. Install the shift control cable onto the shift lever and secure with the clip.
8. Connect the negative battery cable.

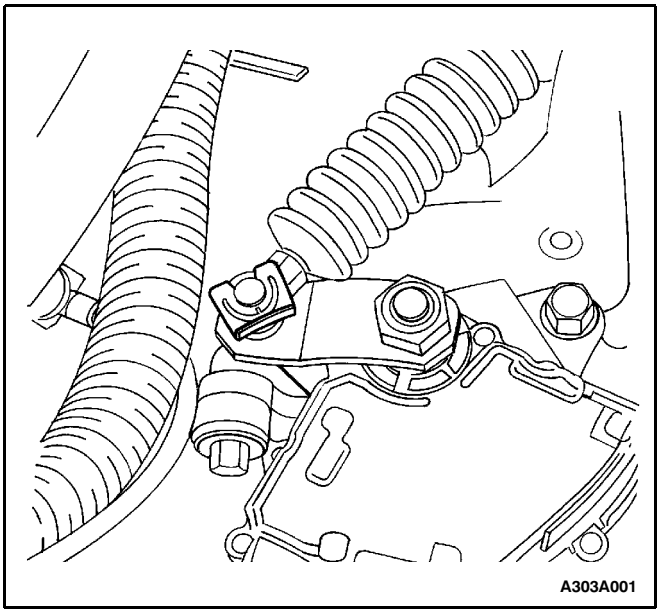

A303A002

CONTROL CABLE ADJUSTMENT

1. Disconnect the negative battery cable.
2. Move the shift lever to the PARK position.
3. Make sure the range selector lever on the transaxle is in the PARK position.


A103A052

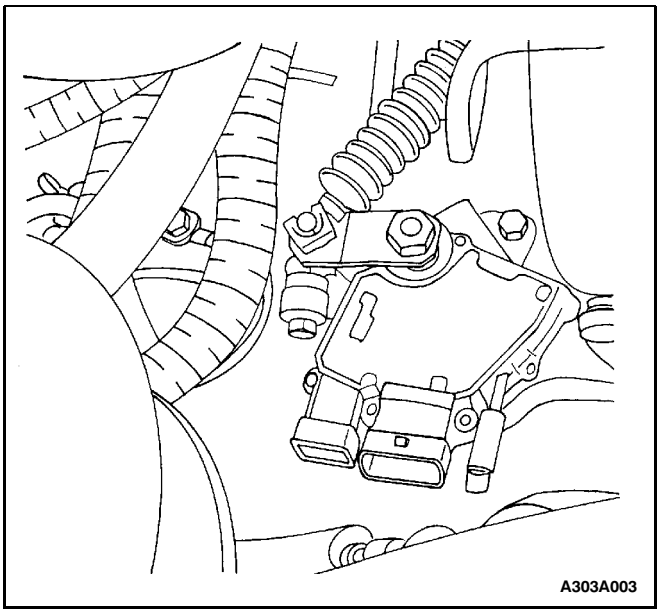
4. Remove the front part of the floor console. Refer to Section 9G, Interior Trim.
5. Loosen the shifter post nut.
6. Pull the shifter control cable until it is tight.
7. Tighten the shifter post nut.
8. Install the the front part of floor console. Refer to Section 9G, Interior Trim.
9. Connect the negative battery cable.


A303A001

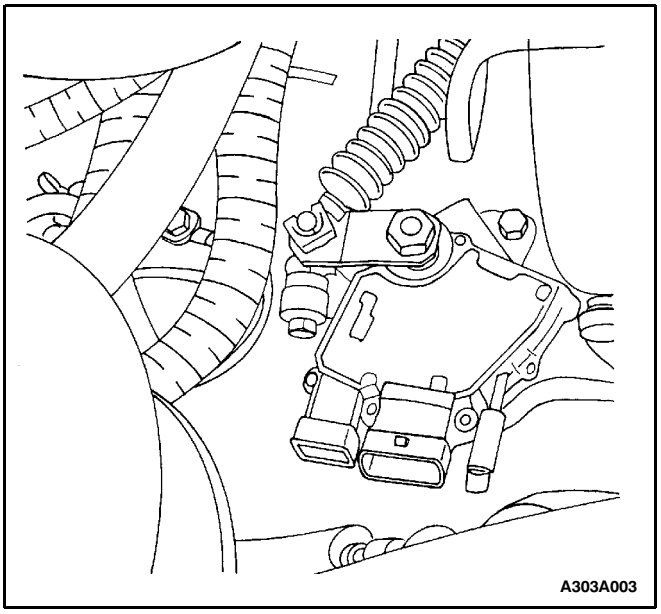
NEUTRAL START SWITCH

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the neutral start switch electrical connector.
3. Disconnect the shift control cable and the retaining clip.

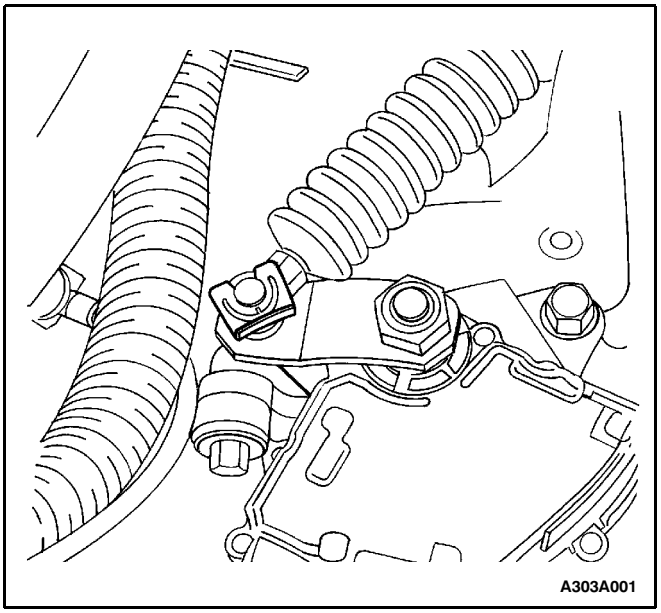


4. Remove the shift lever nut and the shift lever.
5. Remove the neutral start switch.

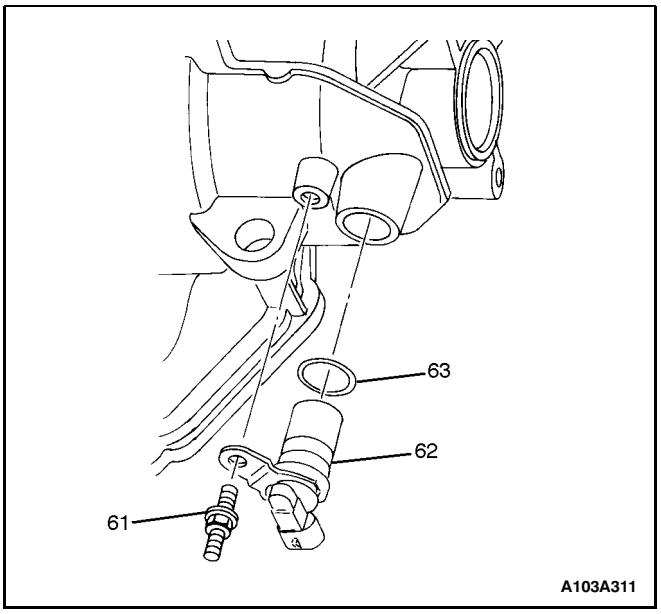


Installation Procedure

1. Install the neutral start switch.
2. Install the shift lever and the shift lever nut.



3. Connect the shift control cable and the retaining clip.
4. Connect the neutral start switch electrical connector.
5. Connect the negative battery cable.



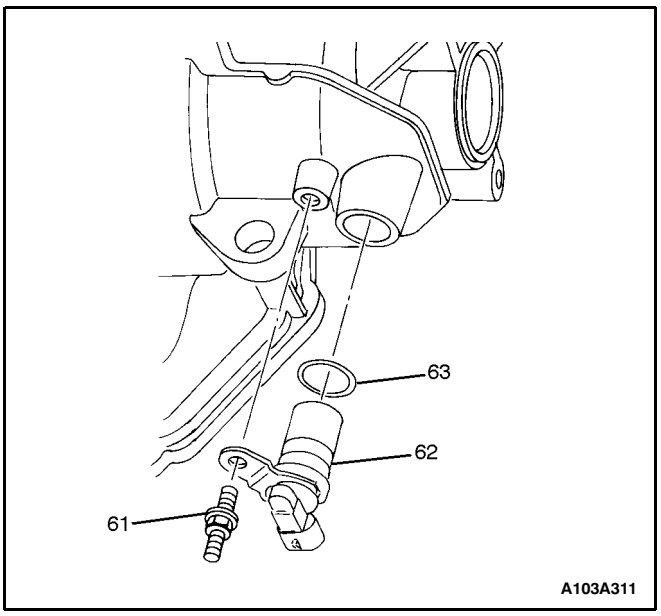
AUTOMATIC TRANSMISSION OUTPUT SPEED SENSOR (A/T OSS)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the A/T OSS electrical connector.
3. Remove the A/T OSS stud (61).

Notice: Be sure to pull the A/T OSS straight out of the transaxle case in order to prevent damage to the case bore.

4. Pull the A/T OSS (62) straight out of the transaxle case.
5. Remove the O-ring (63) from the A/T OSS (62).



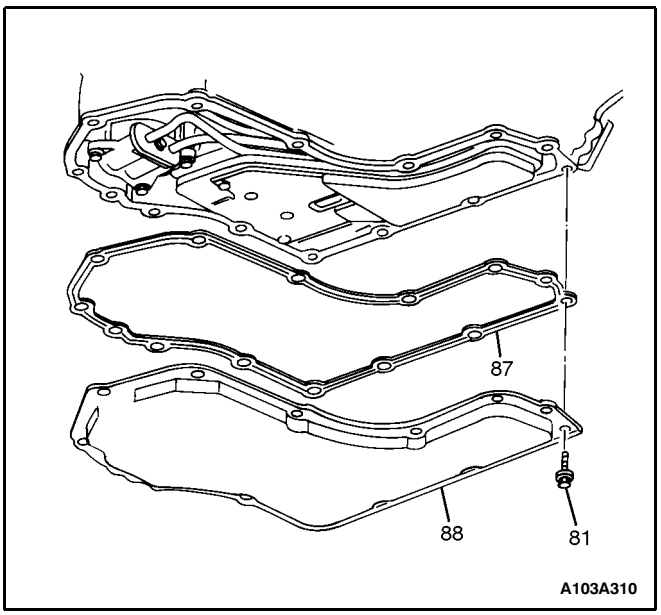
Installation Procedure

1. Inspect the A/T OSS for damage. Clean and dry the A/T OSS. Install the O-ring (63) on the A/T OSS (62).
2. Install the A/T OSS (62) in the transaxle case.
3. Install the A/T OSS stud (61).

Tighten

Tighten the A/T OSS stud (61) to 12 N•m (106 lb-in).

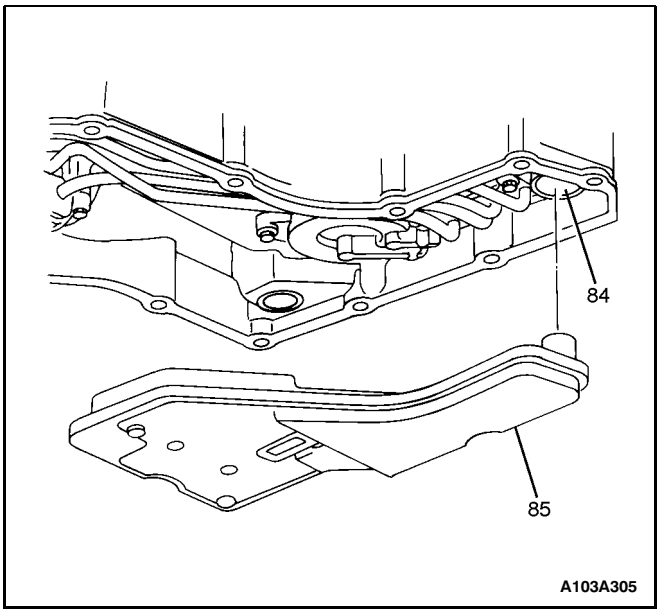
4. Connect the A/T OSS electrical connector.
5. Connect the negative battery cable.



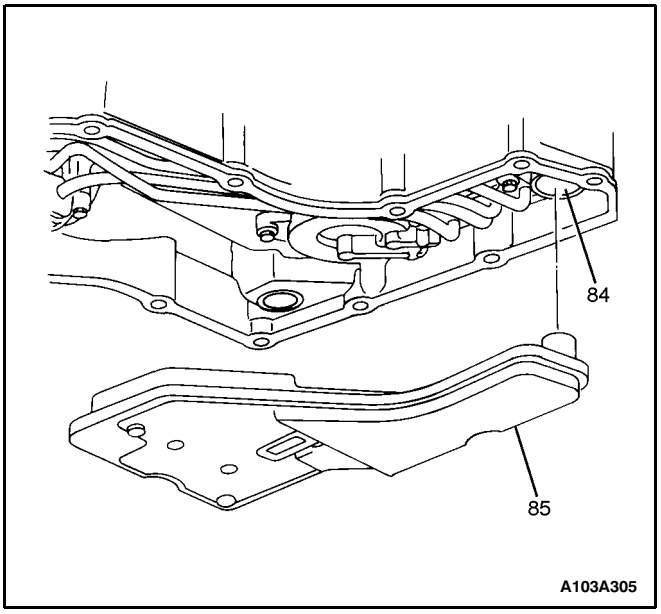
PAN, GASKET, AND FILTER

Removal Procedure

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Place a fluid container below the oil pan.
4. Remove the transaxle oil pan bolts (81) and the pan (88).
5. Remove the transaxle oil pan gasket (87). The gasket is reusable.

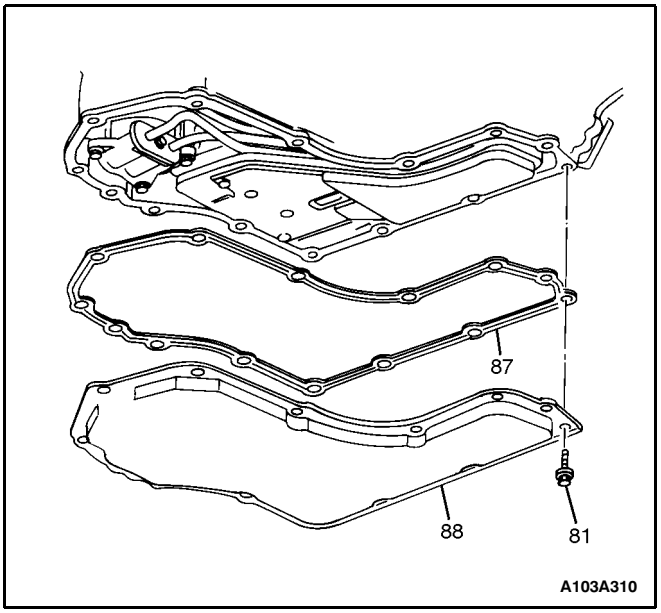


6. Remove the transaxle filter (85) and the neck seal (84).



Installation Procedure

1. Install a new transaxle filter neck seal (84) and a transaxle filter (85).

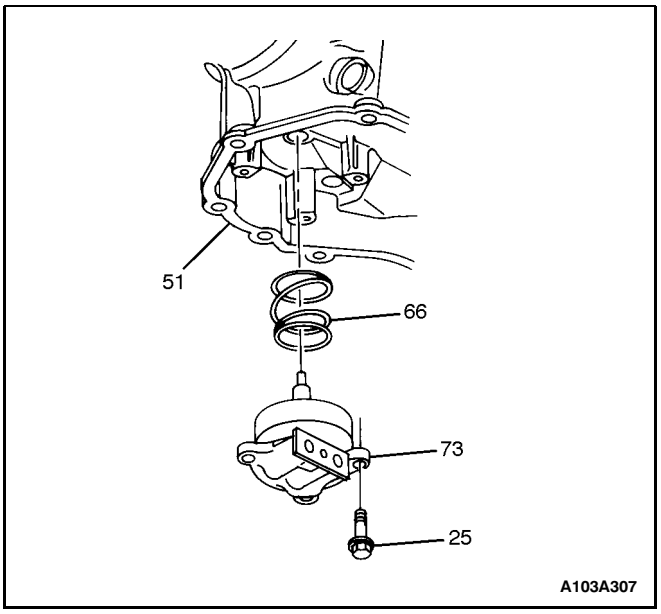


2. Inspect the gasket (87) and the pan (88) for cracks, dents, or cuts. Install the transaxle pan (88) and the gasket (87).
3. Install the transaxle pan bolts (81).

Tighten

Tighten the transaxle pan bolts (81) to 12 N•m (106 lb-in).

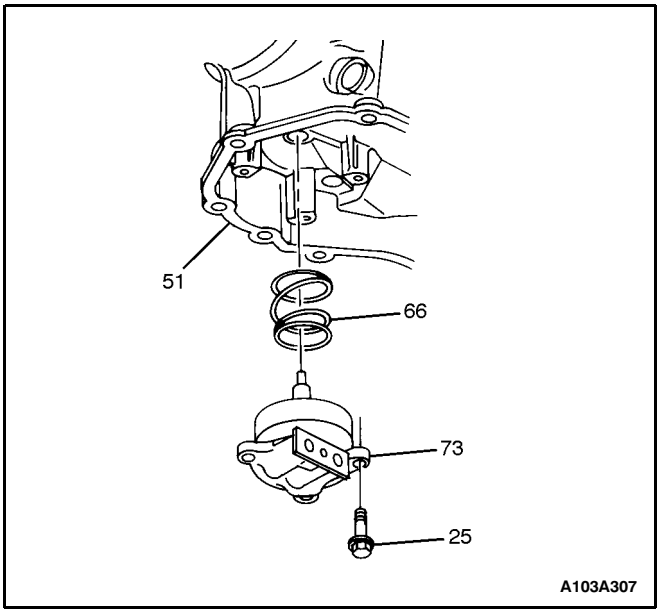
4. Lower the vehicle.
5. Refill the transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
6. Connect the negative battery cable.



REVERSE/LOW SERVO ASSEMBLY

Removal Procedure

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Remove the transaxle pan, gasket, and filter. Refer to "Pan, Gasket and Filter" in this section.
4. Remove the servo cover bolts (25) and the servo cover (73).
5. Remove the piston assembly and the return spring (66).



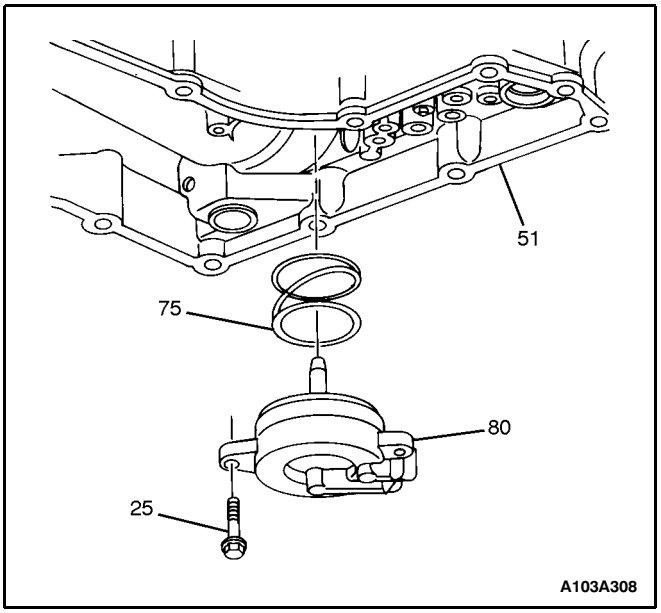
Installation Procedure

1. Install the return spring (66) and the piston assembly.
2. Install the servo cover (73) and the servo cover bolts (25).

Tighten

Tighten the servo cover bolts (25) to 12 N•m (106 lb-in).

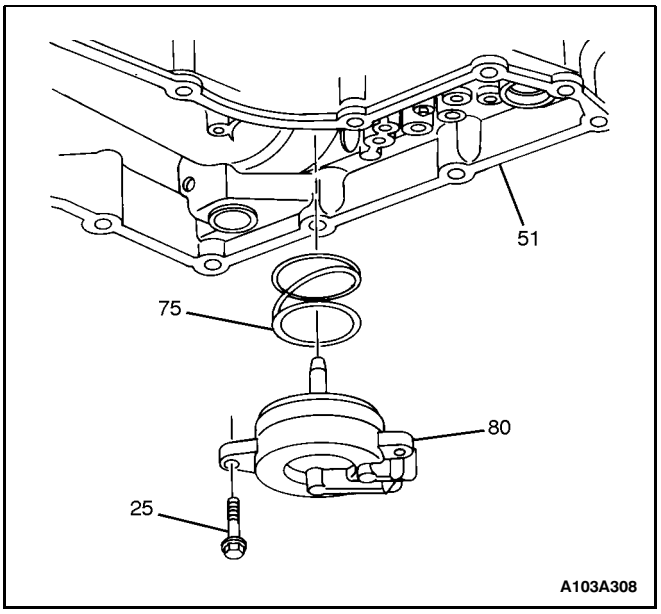
3. Install the transaxle filter, gasket, and pan. Refer to "Pan, Gasket and Filter" in this section.
4. Lower the vehicle.
5. Refill the transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
6. Connect the negative battery cable.



2ND/4TH SERVO ASSEMBLY

Removal Procedure

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Remove the transaxle pan, gasket, and filter. Refer to "Pan, Gasket, and Filter" in this section.
4. Remove the servo cover bolts (25) and the servo cover (80).
5. Remove the piston assembly and the return spring (75).



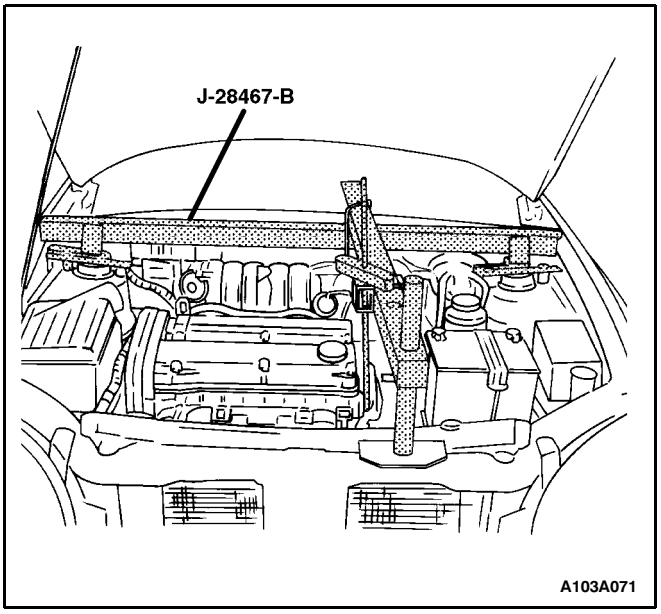
Installation Procedure

1. Install the servo return spring (75), the piston assembly, the servo cover (80), and servo cover bolts (25).

Tighten

Tighten the servo cover bolts (25) to 12 N•m (106 lb-in).

2. Install the transaxle filter, gasket, and pan. Refer to "Pan, Gasket, and Filter" in this section.
3. Lower the vehicle.
4. Refill the transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
5. Connect the negative battery cable.



CASE SIDE COVER AND GASKETS

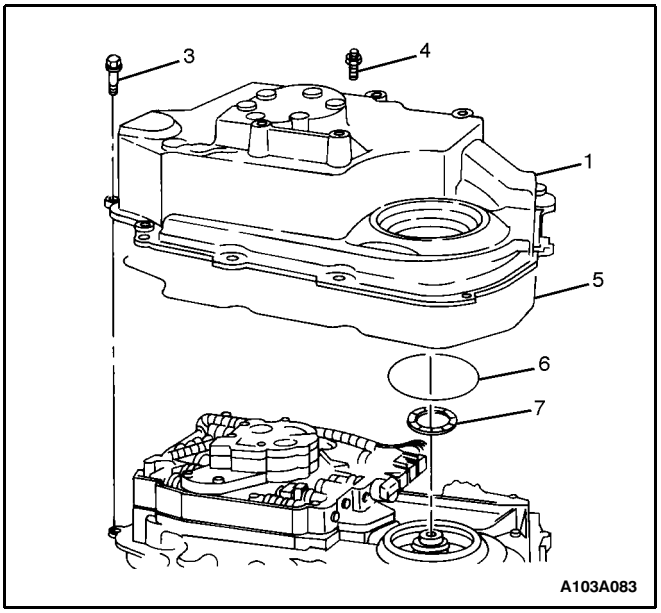
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Tools Required

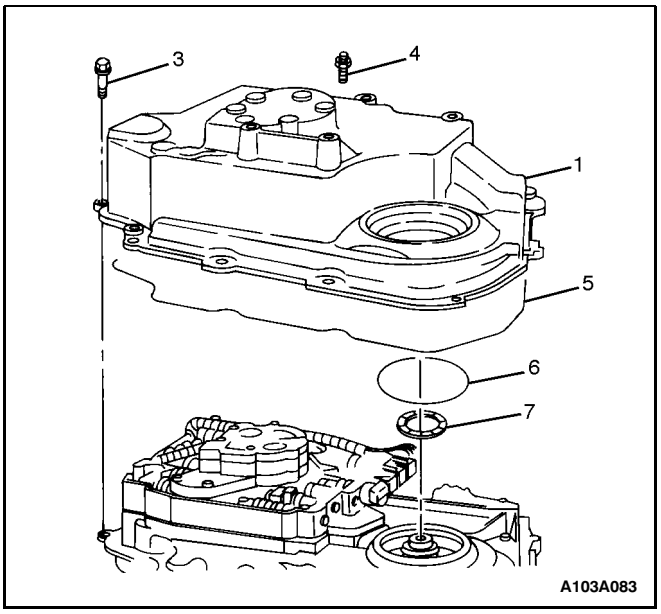
J-28467-B Engine Support Fixture

Removal Procedure

1. Disconnect the negative battery cable.
2. Install the engine support fixture J-28467-B.



3. Raise and suitably support the vehicle.
4. Remove the front exhaust pipe. Refer to Section 1G, Engine Exhaust.
5. Remove the left wheel. Refer to Section 2E, Tires and Wheels.
6. Remove the left drive axle. Refer to Section 3A, Automatic Transaxle Drive Axle.
7. Remove the battery and the battery tray. Refer to Section 1E, Engine Electrical.
8. Remove the left transaxle mount. Refer to "Transaxle Mount" in this section.
9. Lower the engine until the side cover is accessible.
10. Remove the shifter linkage and the neutral start switch. Refer to "Neutral Start Switch" in this section.
11. Remove the side cover bolts (3 and 4), the side cover (1), and the gaskets (6 and 7).

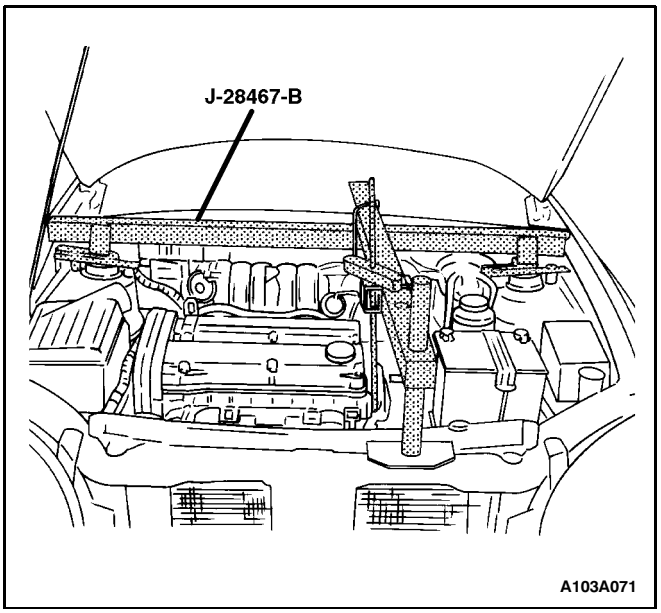


Installation Procedure

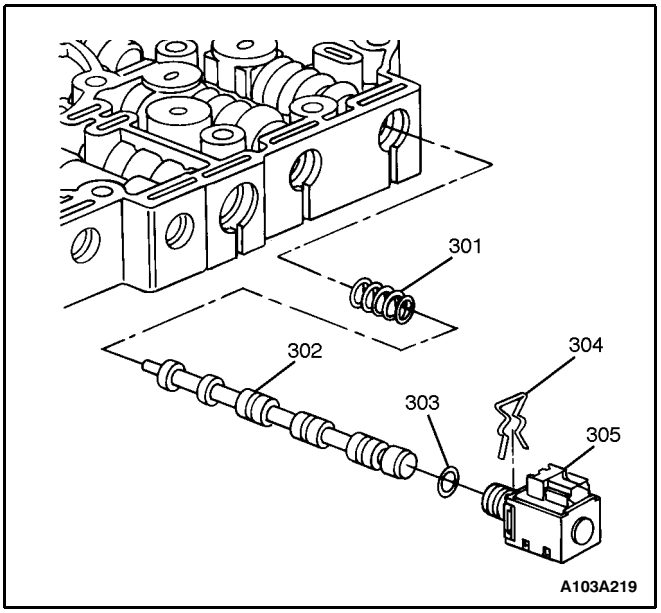
1. Install the side cover (1), the gaskets (6 and 7), and the side cover bolts (3 and 4).

Tighten

Tighten the side cover bolts (3 and 4) to 20 N•m (15 lb-ft).



2. Install the shifter linkage and the neutral start switch. Refer to "Neutral Start Switch" in this section.
3. Raise the engine.
4. Install the left transaxle mount. Refer to "Transaxle Mount" in this section.
5. Install the battery and the battery tray. Refer to Section 1E, Engine Electrical.
6. Install the left drive axle. Refer to Section 3A, Automatic Transaxle Drive Axle.
7. Install the left wheel. Refer to Section 2E, Tires and Wheels.
8. Install the front exhaust pipe. Refer to Section 1G, Engine Exhaust.
9. Lower the vehicle.
10. Remove the engine support fixture J-28467-B.
11. Connect the negative battery cable.



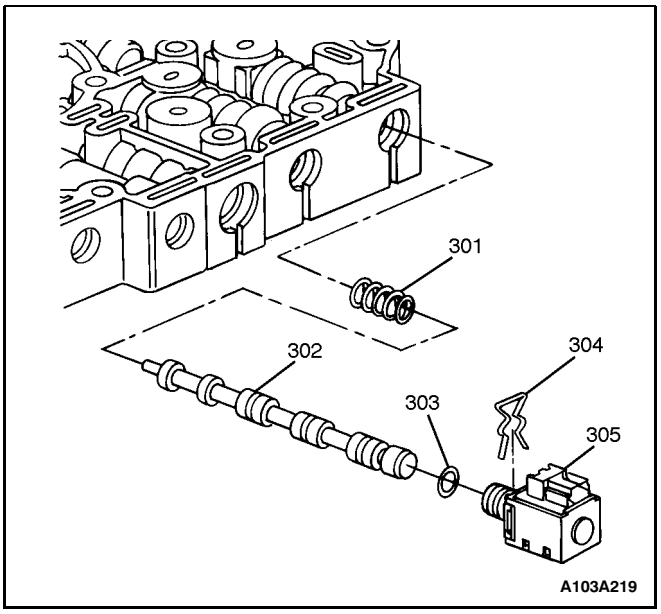
1-2 SHIFT SOLENOID

Removal Procedure

1. Remove the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.
2. Disconnect the electrical connection from the 1-2 shift solenoid (305).

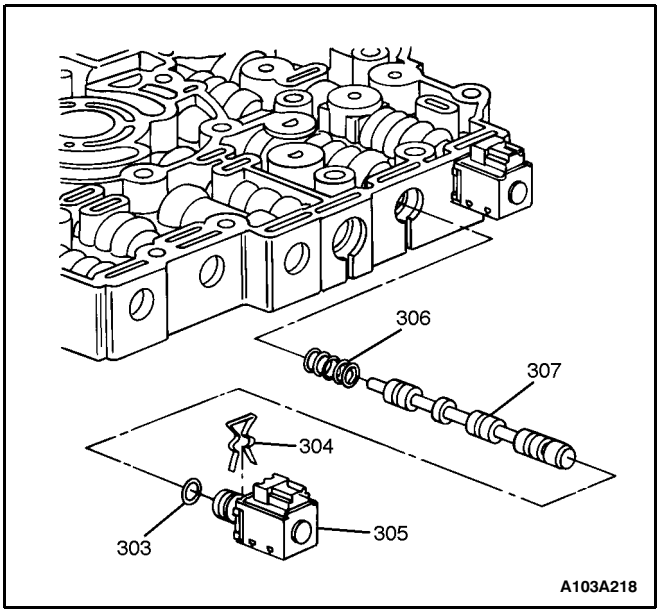
Important: Use a small screwdriver in order to remove the retainer clips. Be careful not to score the valve body when removing the retainer clips.

3. Remove the solenoid retainer clip (304) from the valve body.
4. Remove the 1-2 shift solenoid (305).



Installation Procedure

1. Install the 1-2 shift solenoid (305) into the valve body.
2. Install the retainer clip (304) into the valve body.
3. Connect the electrical connection to the solenoid (305).
4. Install the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.



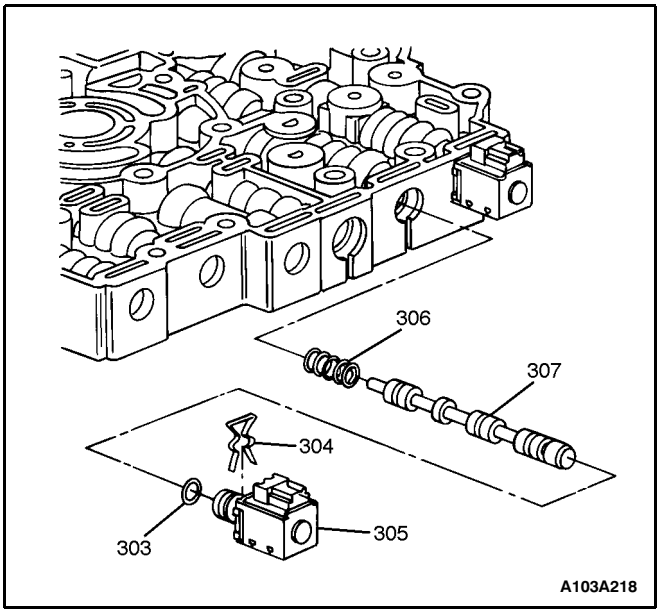
2-3 SHIFT SOLENOID

Removal Procedure

1. Remove the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.
2. Disconnect the electrical connection from the 2-3 shift solenoid (305).

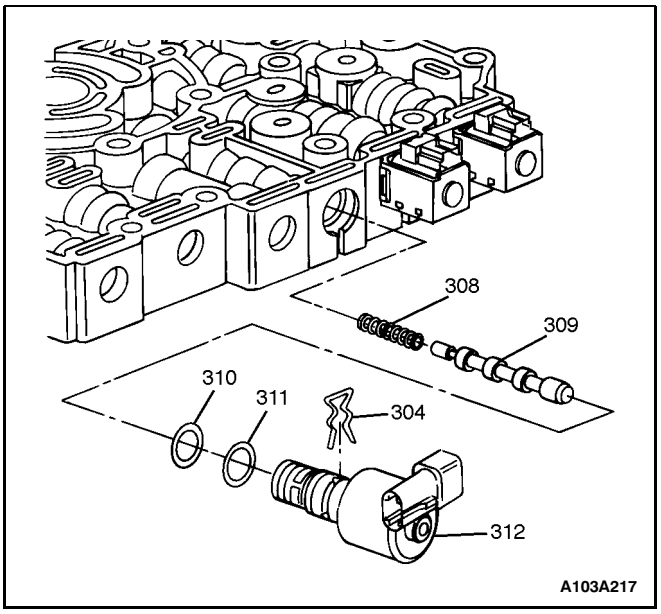
Notice: Use a small screwdriver in order to remove the retainer clips. Be careful not to score the valve body when removing the retainer clips.

3. Remove the solenoid retainer clip (304) from the valve body.
4. Remove the 2-3 shift solenoid (305).



Installation Procedure

1. Install the 2-3 shift solenoid (305) into the valve body.
2. Install the retainer clip (304) into the valve body.
3. Connect the electrical connection to the 2-3 shift solenoid (305).
4. Install the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.



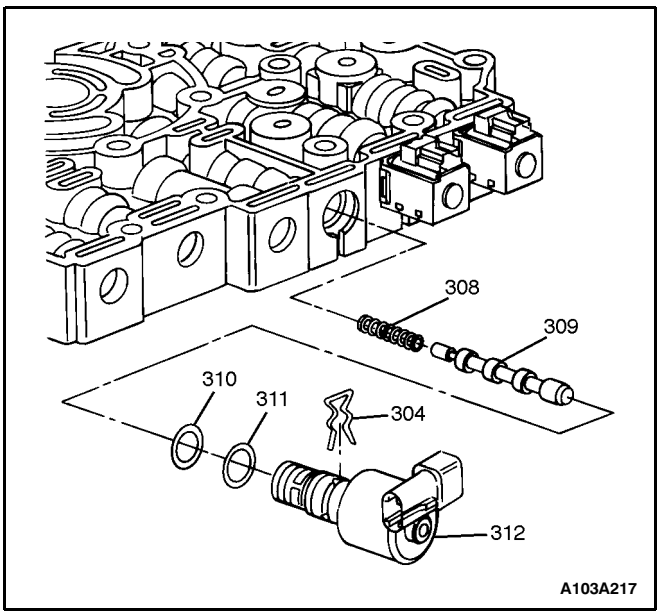
PRESSURE CONTROL SOLENOID

Removal Procedure

1. Remove the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.
2. Disconnect the electrical connection from the pressure control solenoid (PCS) (312).

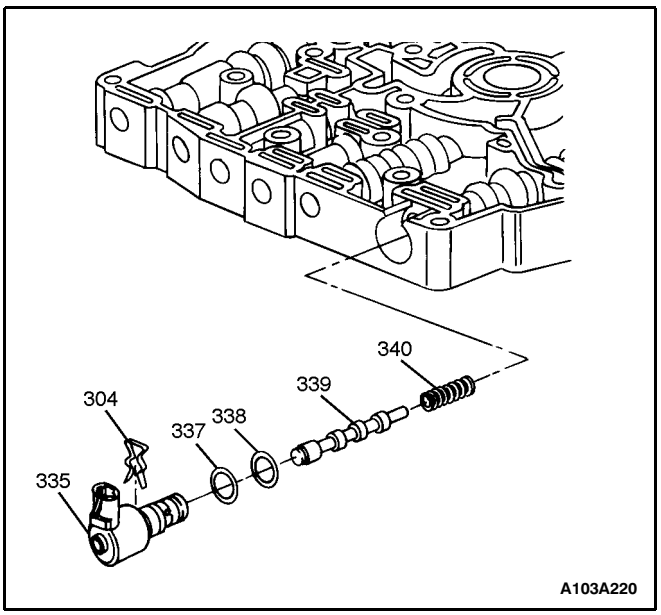
Notice: Use a small screwdriver in order to remove the retainer clips. Be careful not to score the valve body when removing the retainer clips.

3. Remove the solenoid retainer clip (304) from the valve body.
4. Remove the pressure control solenoid (312).



Installation Procedure

1. Install the pressure control solenoid (312) into the valve body.
2. Install the retainer clip (304) into the valve body.
3. Connect the electrical connection to the pressure control solenoid (312).
4. Install the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.



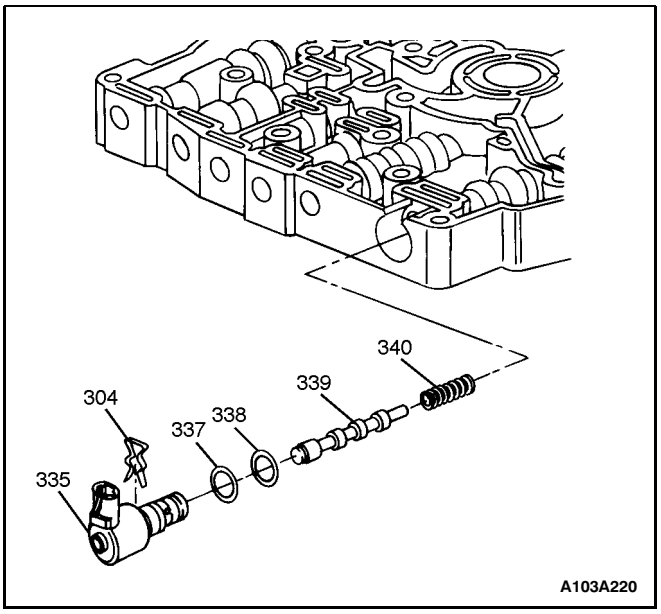
TCC SOLENOID

Removal Procedure

1. Remove the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.
2. Disconnect the electrical connection from the TCC solenoid (335).

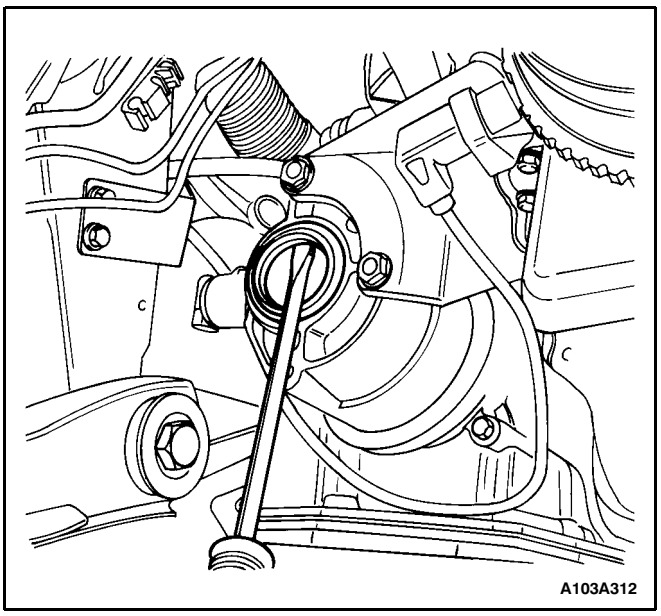
Notice: Use a small screwdriver in order to remove the retainer clips. Be careful not to score the valve body when removing the retainer clips.

3. Remove the solenoid retainer clip (304) from the valve body.
4. Remove the TCC solenoid (335).



Installation Procedure

1. Install the TCC solenoid (335) into the valve body.
2. Install the retainer clip (304) into the valve body.
3. Connect the electrical connection to the solenoid (335).
4. Install the transaxle side cover. Refer to "Case Side Cover and Gaskets" in this section.



DRIVE AXLE OIL SEAL

Tools Required

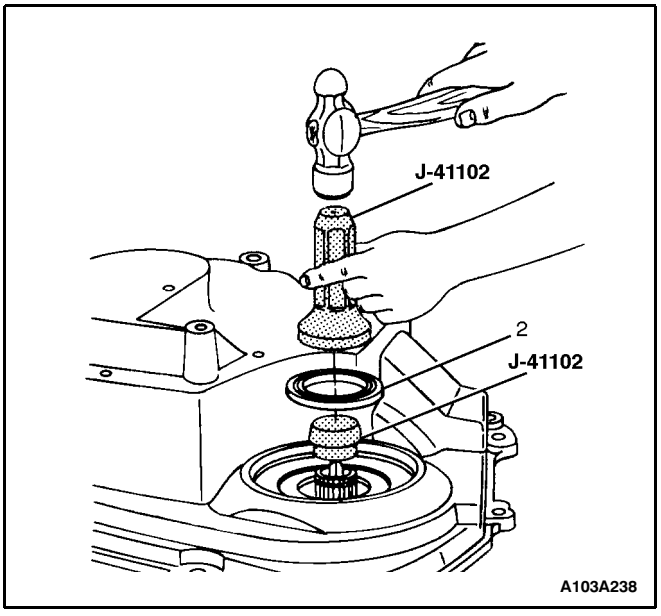
J-41102 Axle Seal Installer

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the drive axles. Refer to Section 3A, Automatic Transaxle Drive Axle.

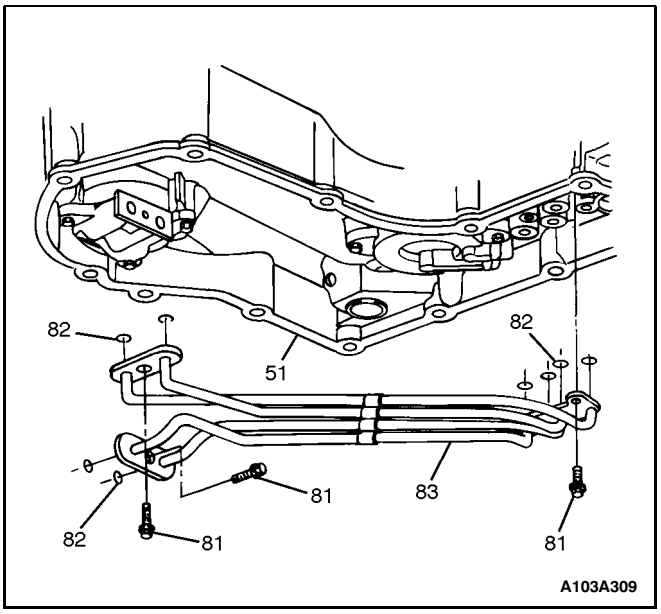
Notice: Be careful not to damage the bore of the transaxle case.

3. Remove the transaxle drive seal using a screwdriver. If necessary, crush the seal first with the screwdriver in order to loosen the seal from the case.



Installation Procedure

1. Install the transaxle drive seal (2) using the axle seal installer J-41102.
2. Install the drive axles. Refer to Section 3A, Automatic Transaxle Drive Axle.
3. Connect the negative battery cable.

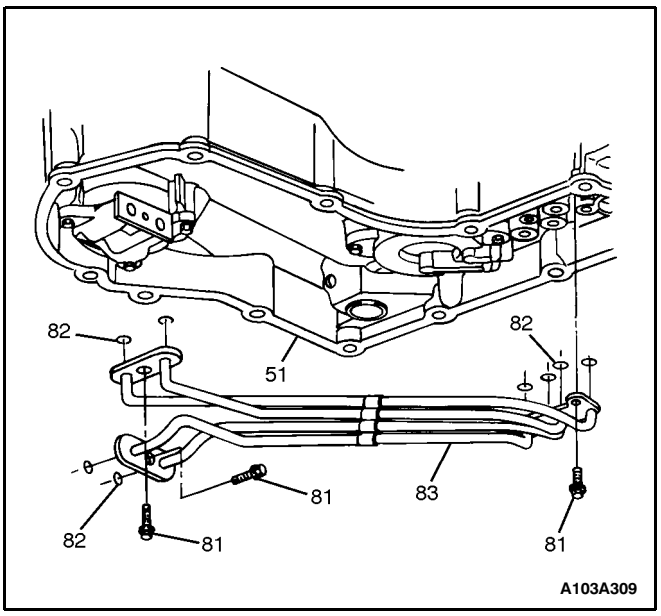


A103A309

OIL COOLER PIPES

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the transaxle oil pan and the filter. Refer to "Pan, Gasket, and Filter" in this section.
3. Remove the oil pipe bolts (81) and the pipes (83) from the transaxle case (51).



A103A309

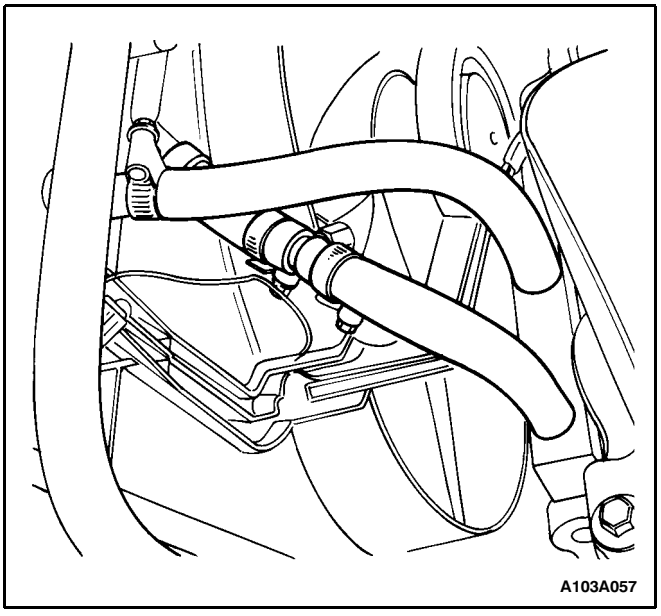
Installation Procedure

1. Install the oil pipes (83) and the oil pipe bolts (81).

Tighten

Tighten the oil pipe bolts (81) to 12 N•m (106 lb-in).

2. Install the transaxle oil pan and filter. Refer to "Pan, Gasket, and Filter" in this section.
3. Connect the negative battery cable.

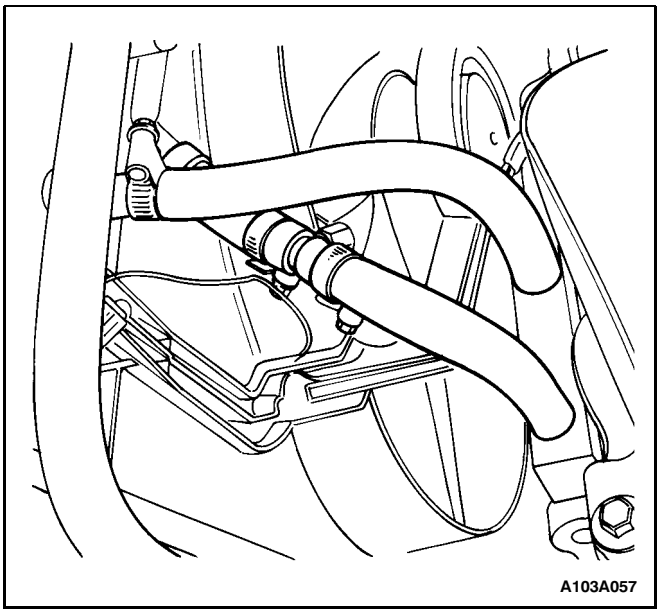

A103A057

OIL COOLER HOSES

Removal Procedure

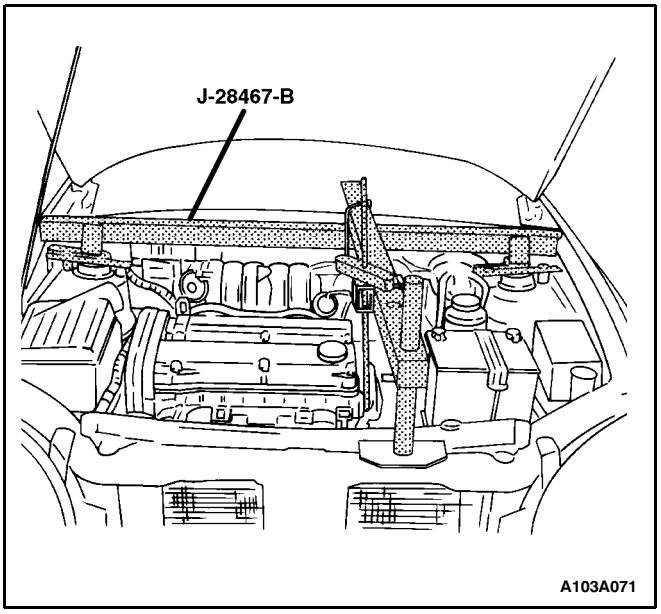
Important: Place a drip pan under the hoses to catch the fluid that will run out of the lines.

1. Loosen the hose clamps and disconnect the hoses from the transaxle.
2. Loosen the hose clamps and disconnect the hoses from the radiator.


A103A057

Installation Procedure

1. Install the hose clamps onto the radiator hoses.
2. Install the hoses onto the radiator.
3. Tighten the radiator hose clamps.
4. Install the hose clamps onto the transaxle hoses.
5. Install the hoses onto the transaxle.
6. Tighten the transaxle hose clamps.
7. Refill the transaxle fluid. Refer to "Transaxle Fluid Checking Procedure" in this section.



A103A071

TRANSAXLE MOUNT

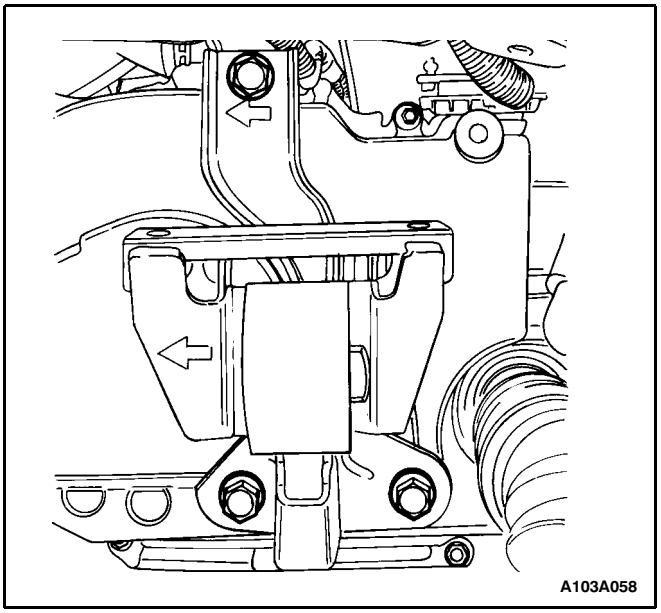
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Tools Required

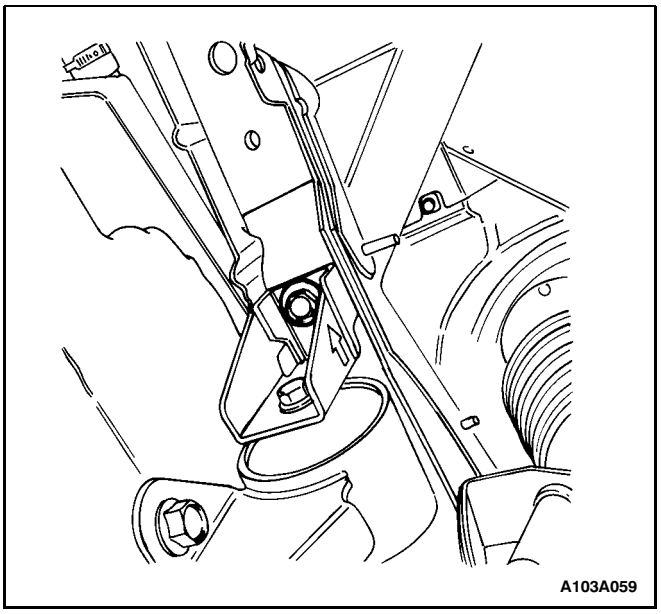
J-28467-B Engine Support Fixture

Removal Procedure

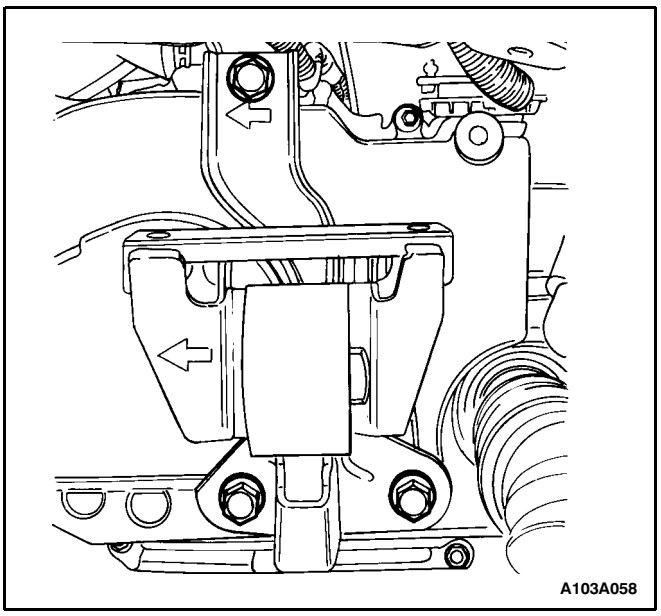
1. Disconnect the negative battery cable.
2. Install the engine support fixture J-28467-B.
3. Raise and suitably support the vehicle.
4. Remove the left front wheel. Refer to Section 2E, Tires and Wheels.


A103A058

5. Remove the left side under cover. Refer to Section 9N, Frame and Underbody.
6. Remove the bolts from the transaxle mount.


A103A059

7. Remove the bolts from the frame and remove the transaxle mount.

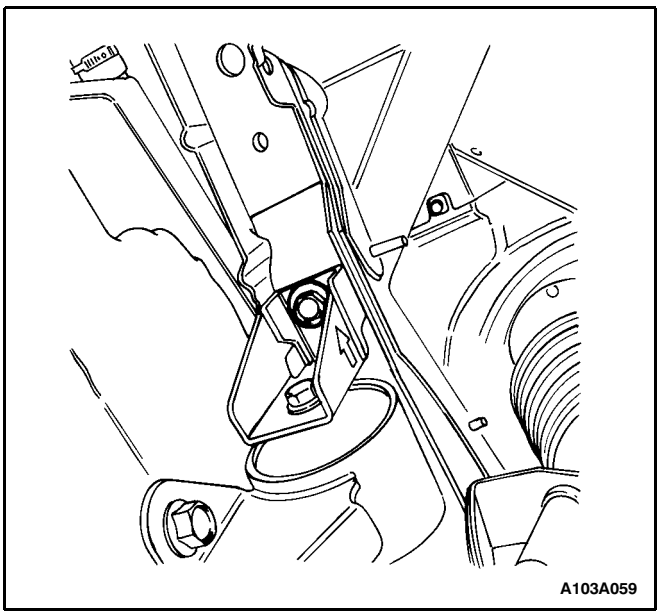

A103A058

Installation Procedure

1. Install the transaxle mount and the transaxle mount bolts.

Tighten

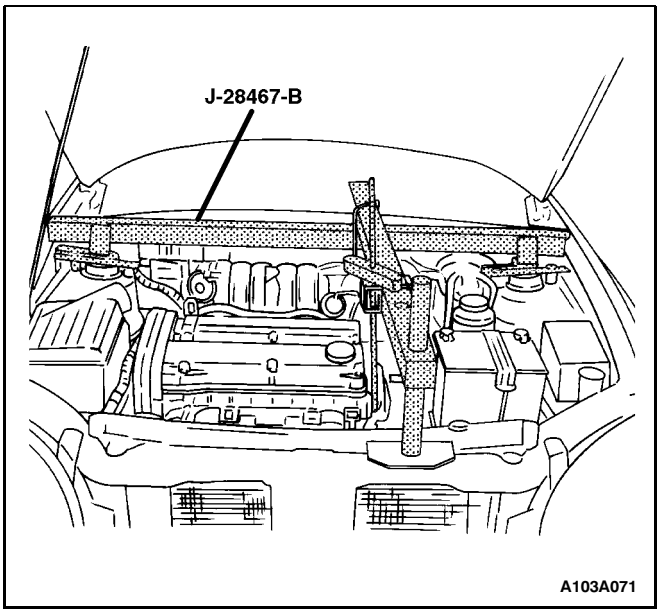
Tighten the transaxle mount bolts to 75 N•m (55 lb-ft).


A103A059

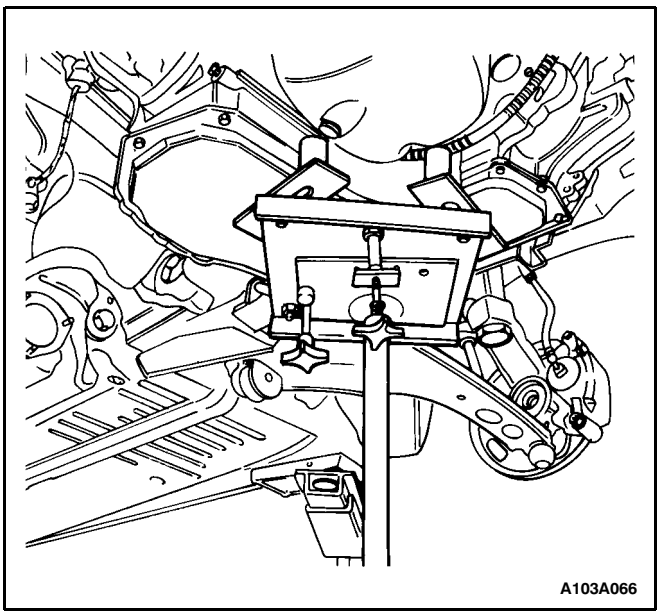
2. Raise the engine.
3. Install the bolts to the frame.

Tighten

Tighten the frame bolts to 75 N•m (55 lb-ft).



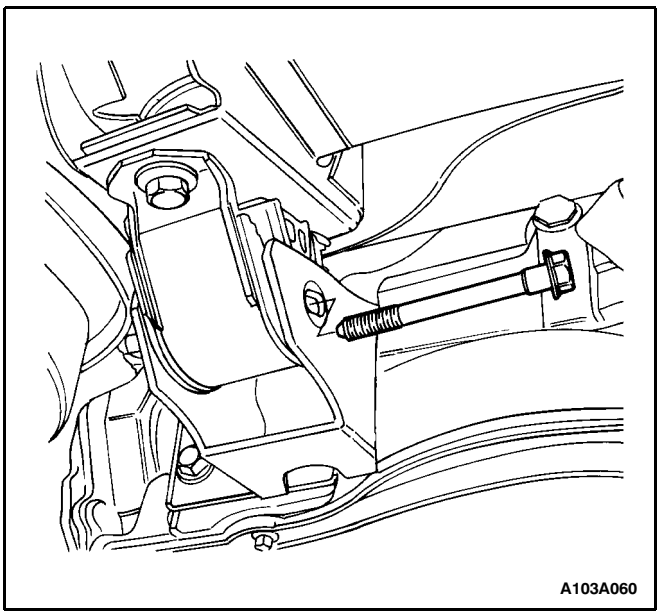
4. Install the left side splash shield. Refer to Section 9N, Frame and Underbody.
5. Install the left front wheel. Refer to Section 2E, Tires and Wheels.
6. Lower the vehicle.
7. Remove the engine support fixture J-28467-B.
8. Refill the transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
9. Connect the negative battery cable.



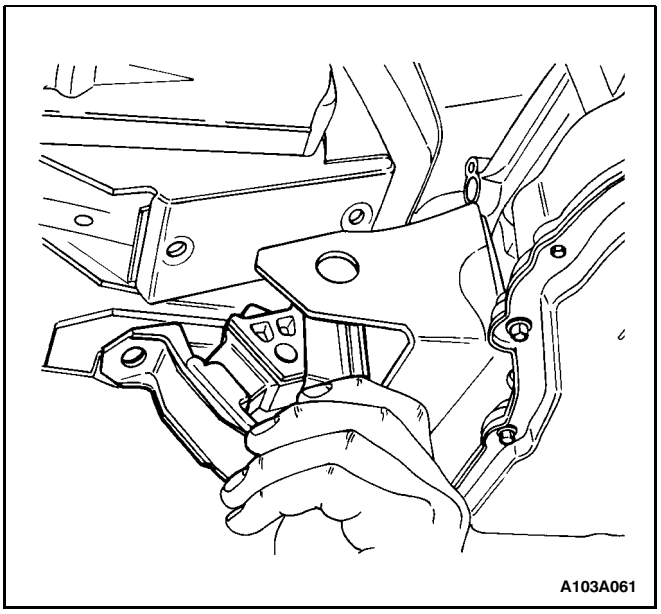
TRANSAXLE BRACKET

Removal Procedure

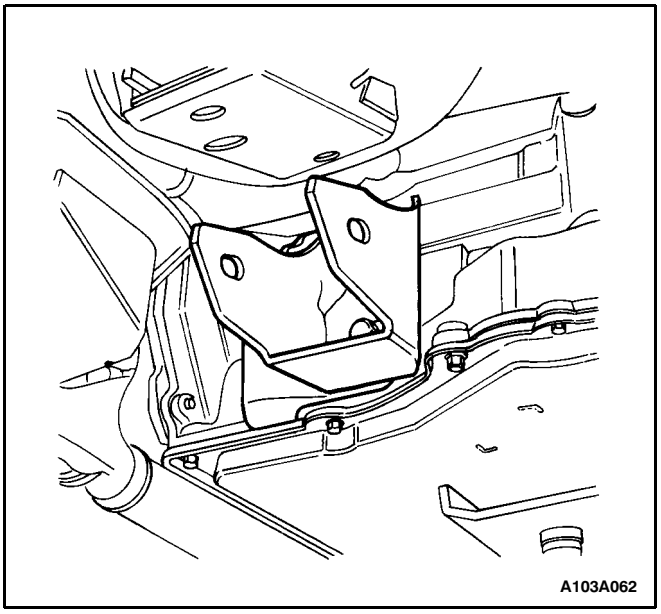
1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Install the transaxle jack.



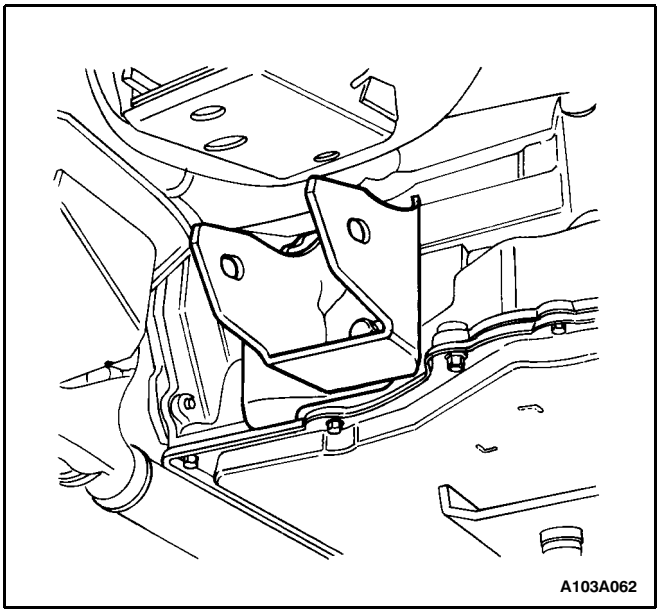
4. Remove the pivot bolt.


A103A061

5. Remove the bolts and the transaxle mounting bracket from the frame.

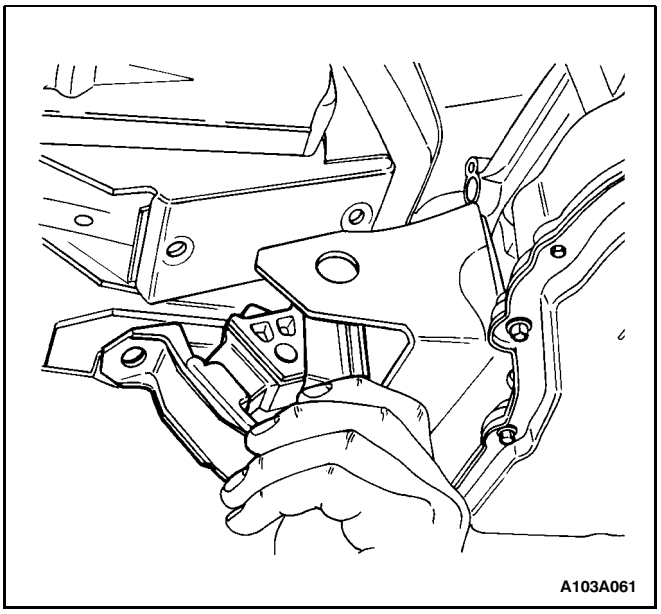

A103A062

6. Remove the bolts and the transaxle mounting bracket from the transaxle.


A103A062

Installation Procedure

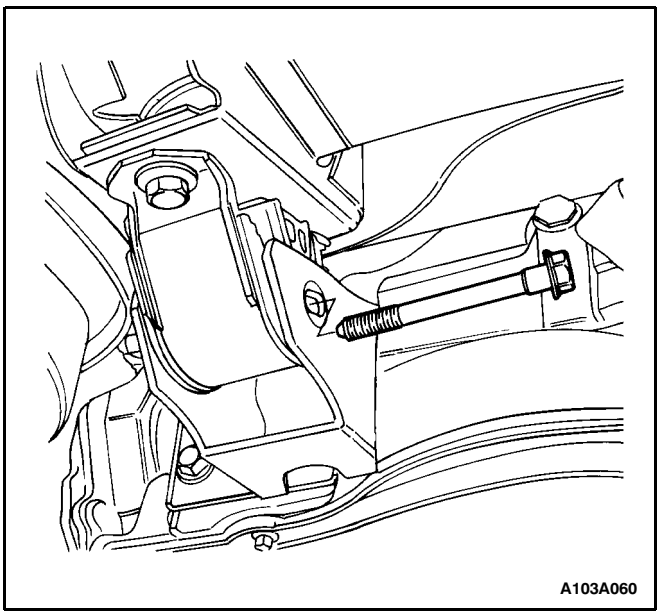
1. Install the transaxle mounting bracket on the transaxle. Install the bolts.



2. Install the transaxle mounting bracket on the frame. Install the bolts.

Tighten

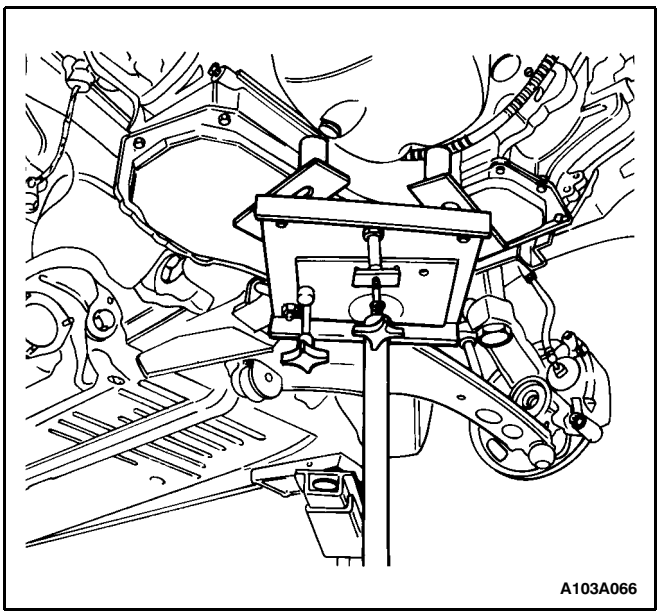
Tighten the transaxle mounting bracket bolts to 75 N•m (55 lb-ft).



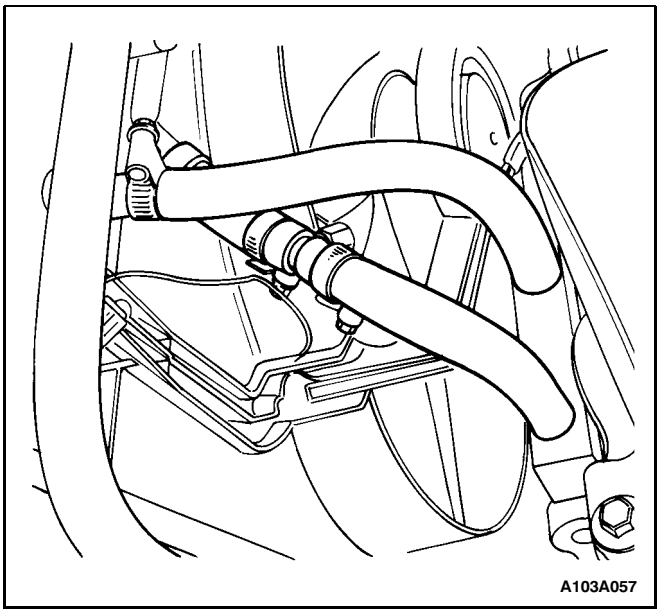
3. Install the pivot bolt.

Tighten

Tighten the pivot bolt to 65 N•m (48 lb-ft).



4. Remove the transaxle jack.
5. Lower the vehicle.
6. Connect the negative battery cable.


A103A057

TRANSAXLE ASSEMBLY

(Left-Hand Drive Shown, Right-Hand Drive Similar)

Tools Required

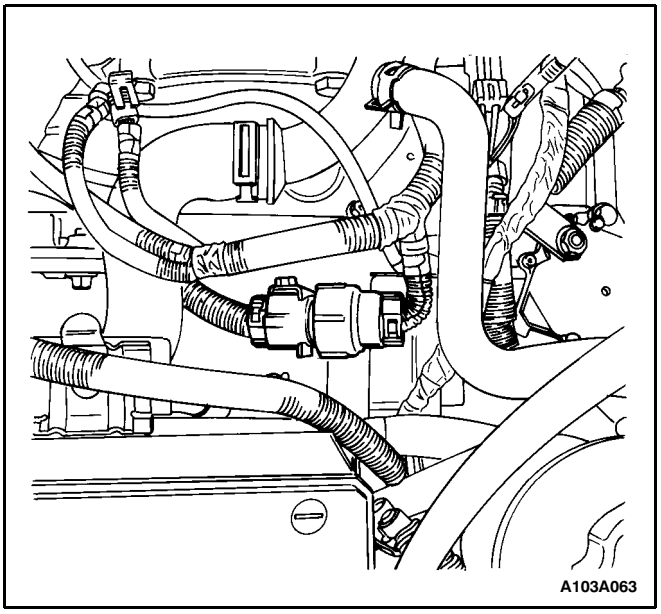
J-28467-B Engine Support Fixture

Removal Procedure

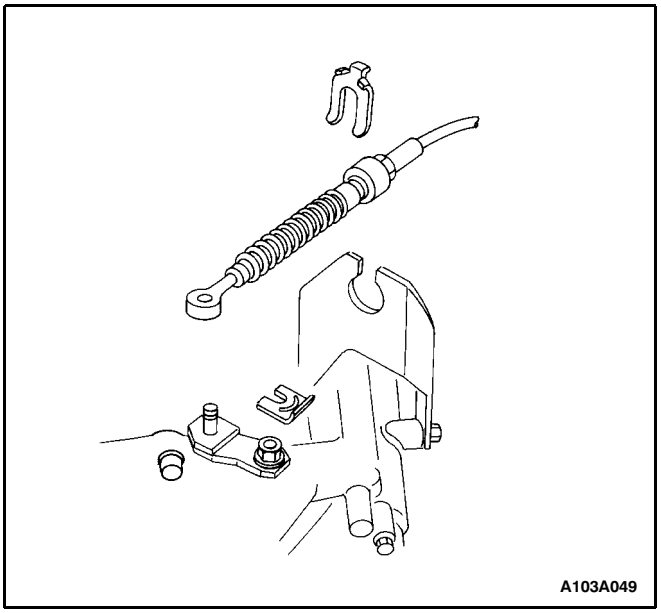
1. **Disconnect the negative battery cable.**

Important: Be sure to have a pan ready to catch any transaxle fluid that might come out.

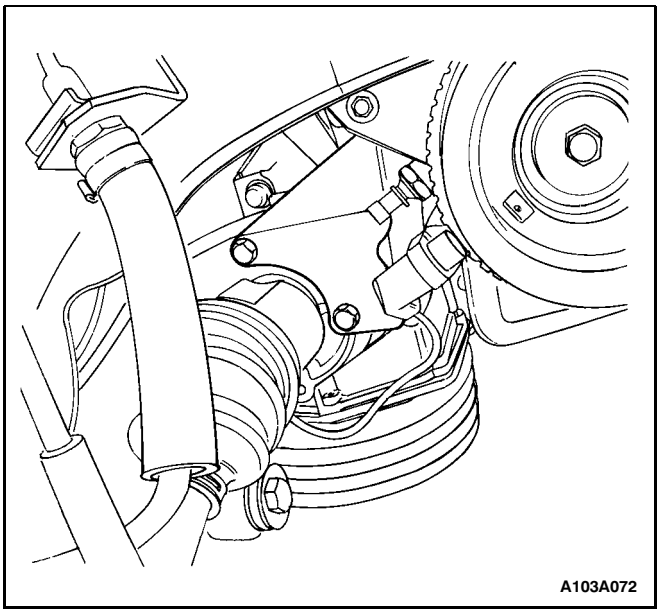
2. **Disconnect the transaxle cooler lines from the transaxle.**


A103A063

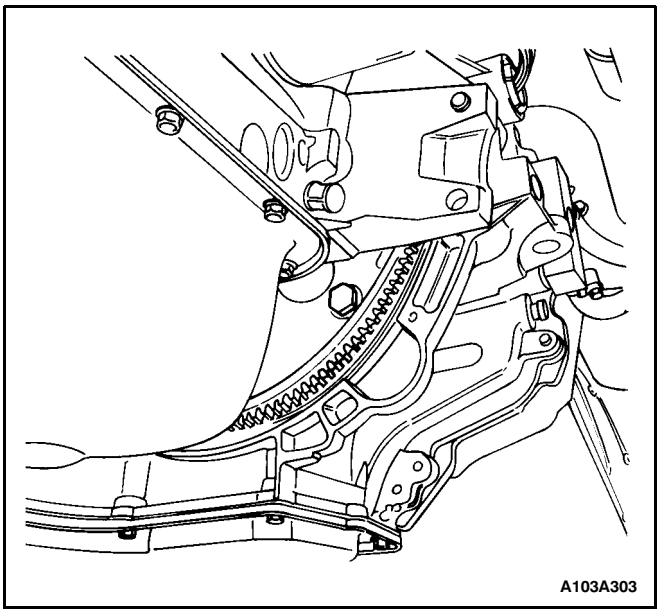
3. **Disconnect the transaxle wiring harness.**


A103A049

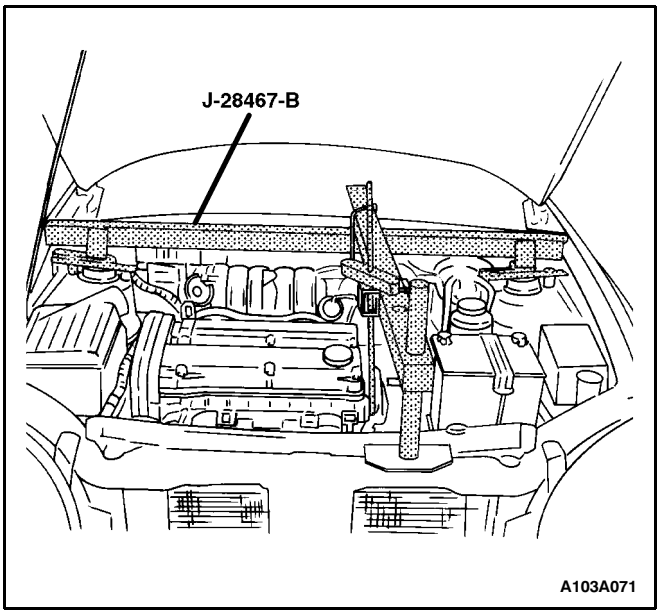
4. **Disconnect the neutral start switch electrical connector.**
5. **Disconnect the shift cable from the shift lever and the shift cable mounting bracket.**



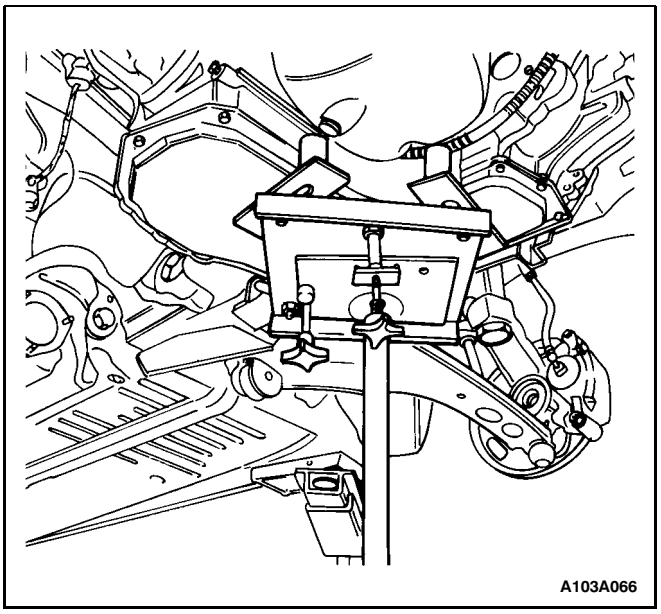
6. Disconnect the automatic transmission output speed sensor (A/T OSS) electrical connector.



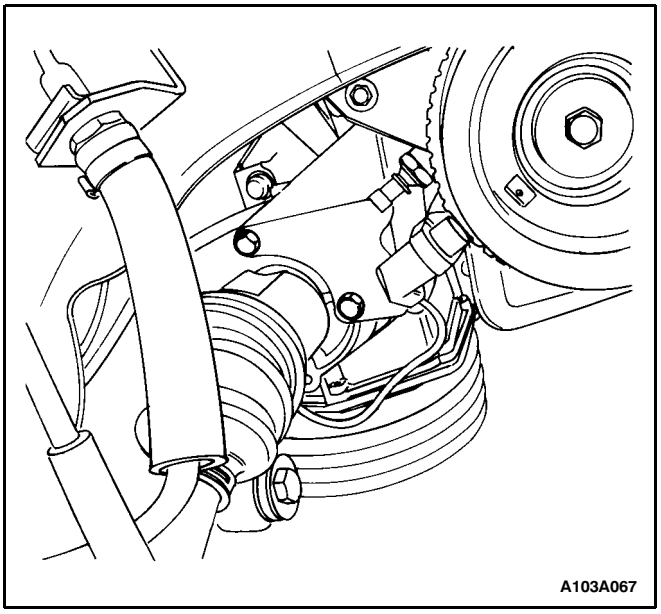
7. Remove the front exhaust pipe. Refer to Section 1G, Engine Exhaust.
8. Remove the drive axles. Refer to Section 3A, Automatic Transaxle Drive Axle.
9. Remove the flywheel inspection shield.
10. Remove the flywheel bolts.



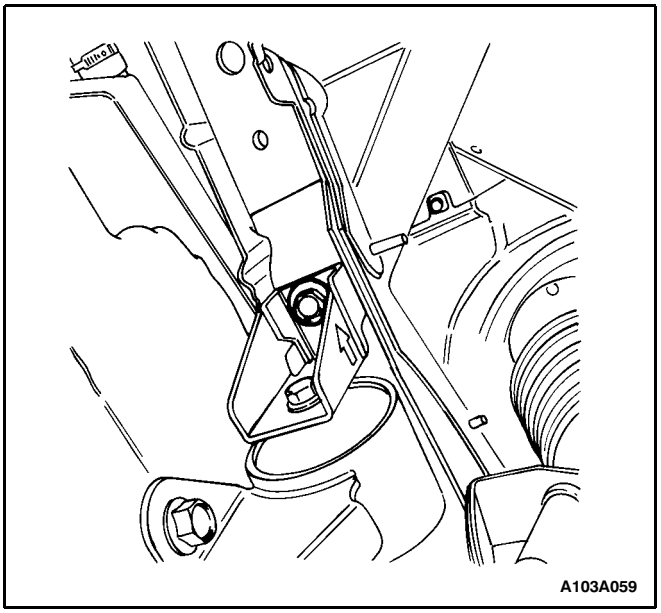
11. Install the engine support fixture J-28467-B.


A103A066

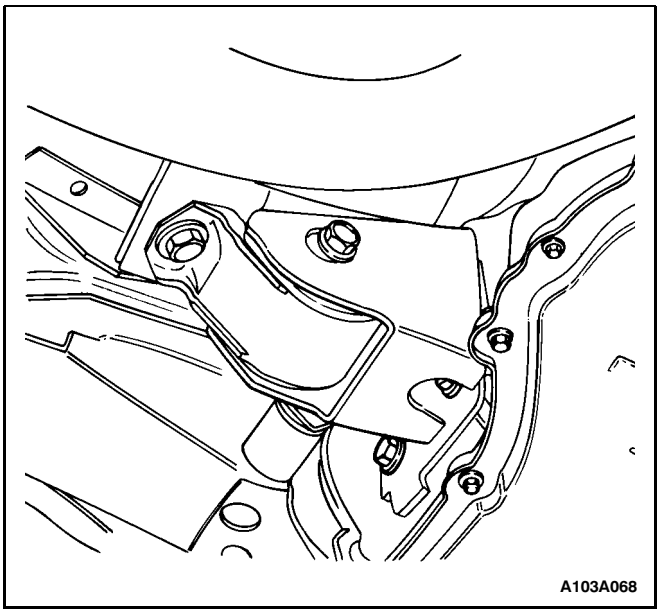
12. Install the transaxle support jack.


A103A067

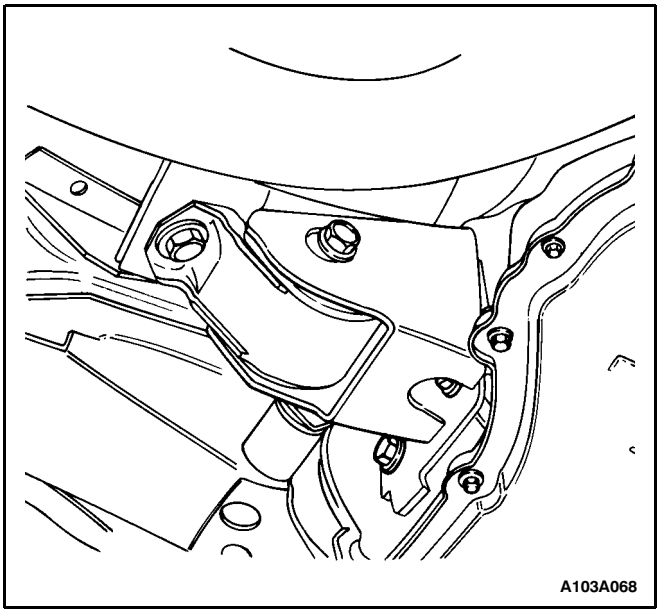
13. Remove the bell housing bolts.
14. Disconnect the right transaxle mount bolts.


A103A059

15. Disconnect the left transaxle mount bolts.


A103A068

16. Remove the rear transaxle mount bolts.
17. Remove the transaxle from the vehicle.

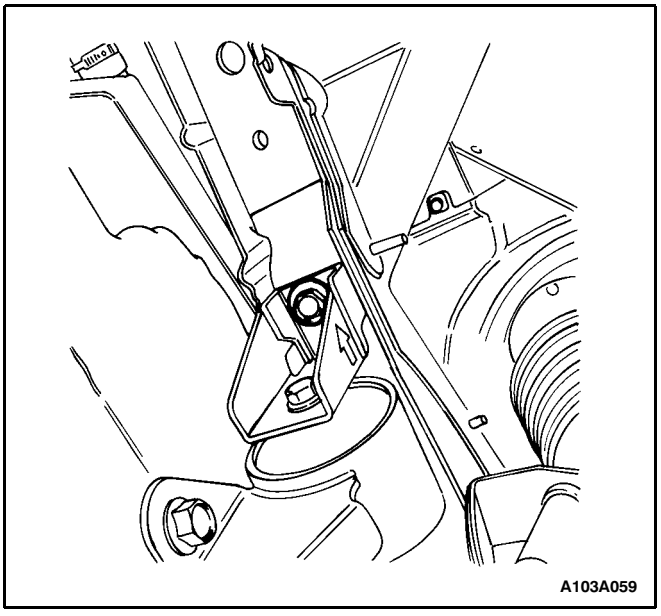

A103A068

Installation Procedure

1. Install the transaxle into the vehicle.
2. Install the rear transaxle mount bolts.

Tighten

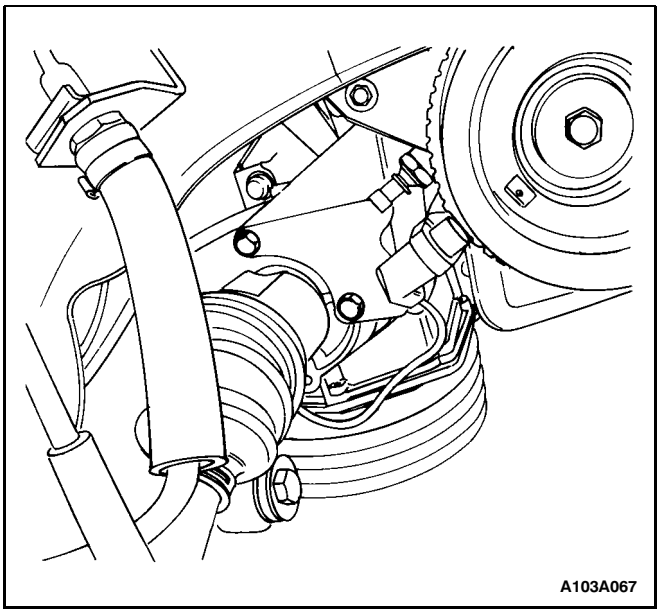
Tighten the rear transaxle mount bolts to 75 N•m (55 lb-ft).


A103A059

3. Connect the left transaxle mount bolts.

Tighten

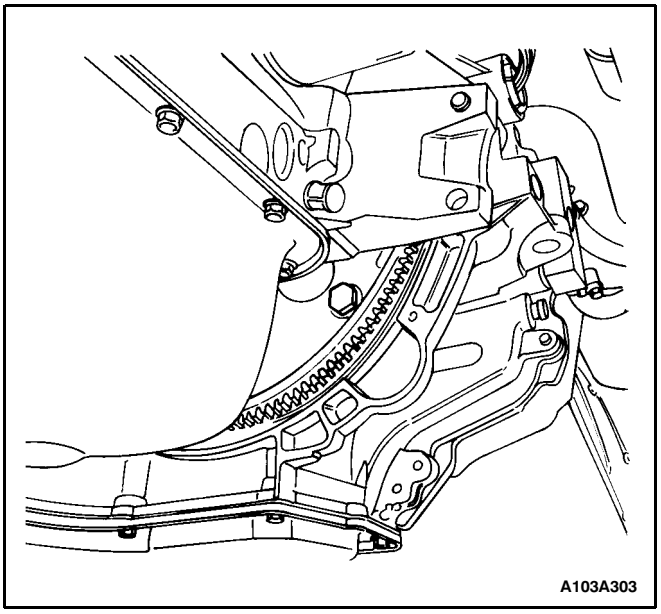
Tighten the left transaxle mount bolts to 75 N•m (55 lb-ft).



4. Connect the right transaxle mount bolts.

Tighten

Tighten the right transaxle mount bolts to 75 N•m (55 lb-ft).



5. Install the bell housing bolts.

Tighten

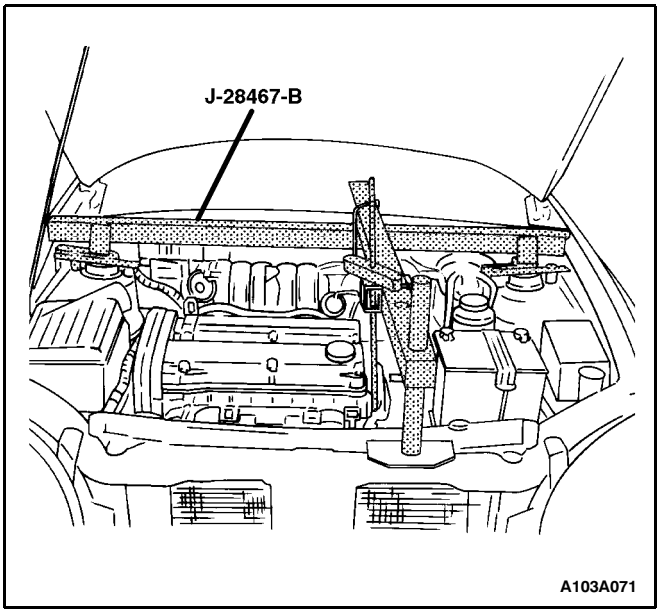
Tighten the bell housing bolts to 75 N•m (55 lb-ft).

6. Install the flywheel bolts.

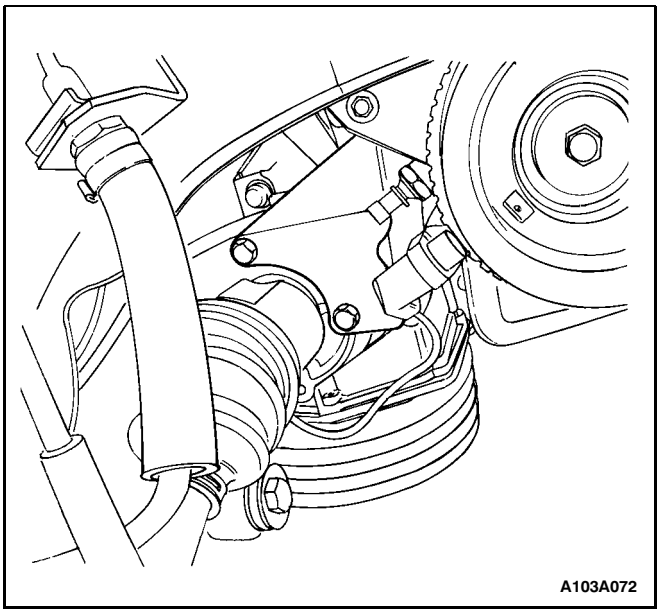
Tighten

Tighten the flywheel bolts to 65 N•m (48 lb-ft).

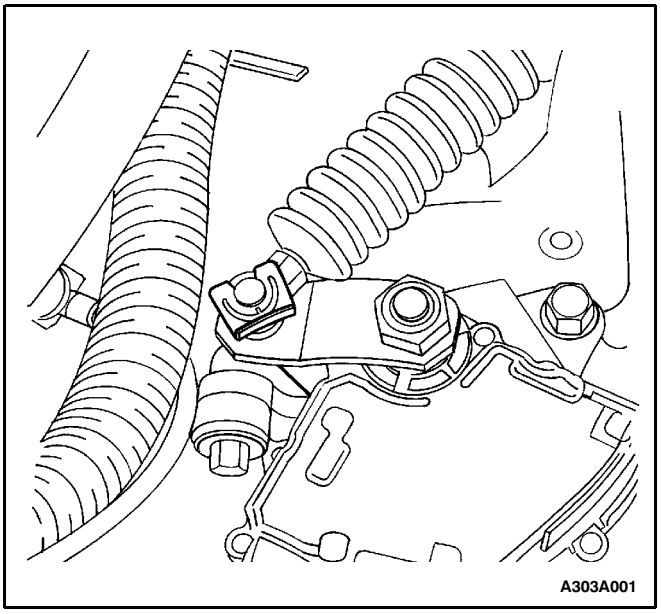
7. Install the flywheel inspection shield.



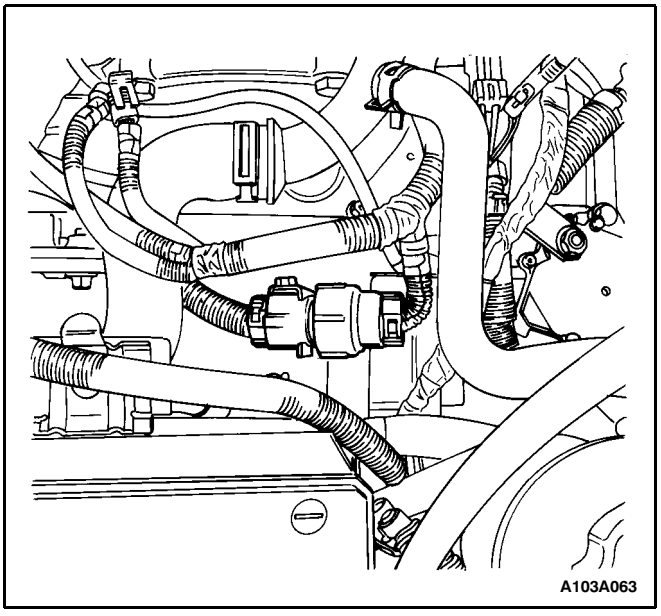
8. Remove the transaxle support jack.
9. Remove the engine support fixture J-28467-B.


A103A072

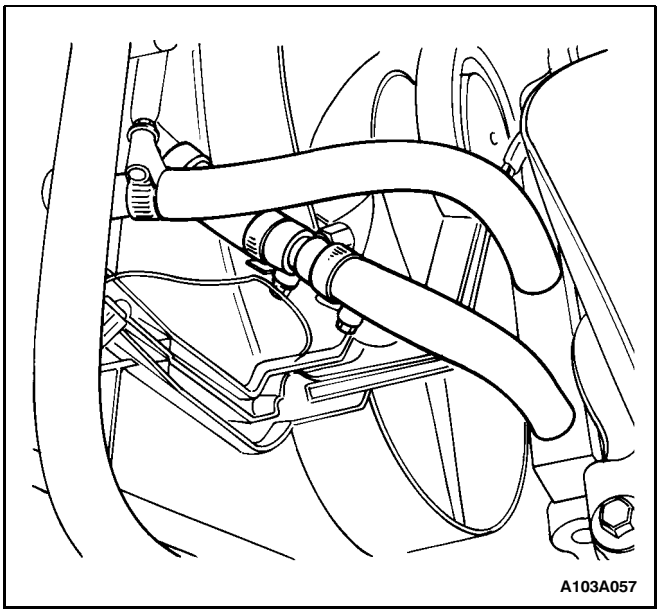
10. Install the drive axles. Refer to Section 3A, Automatic Transaxle Drive Axle.
11. Install the front exhaust pipe. Refer to Section 1G, Engine Exhaust.
12. Connect the A/T OSS electrical connector.


A303A001

13. Connect the shift cable to the shift lever and the shift cable mounting bracket.


A103A063

14. Connect the neutral start switch electrical connector.
15. Connect the transaxle wiring harness.


A103A057

16. Connect the transaxle cooler lines to the transaxle and install the hose clamps.
17. Add transaxle fluid. Refer to "Transaxle Fluid Level Checking Procedure" in this section.
18. Connect the negative battery cable.

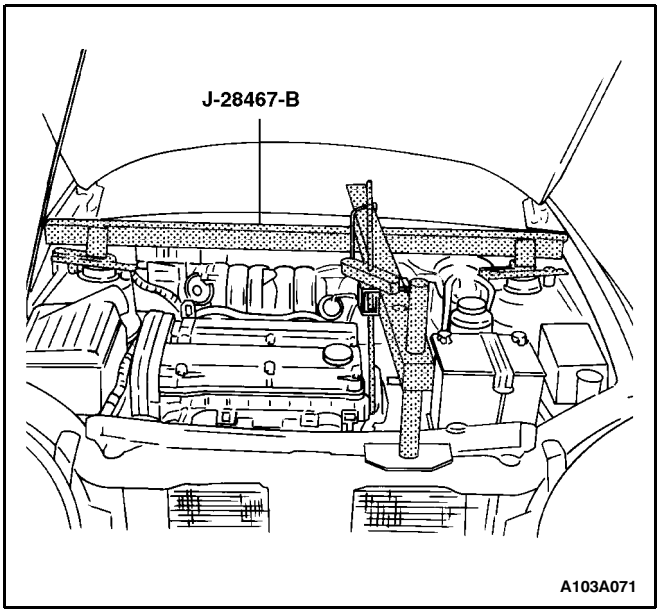
TRANSAXLE BRACE

(Left-Hand Drive Shown, Right-Hand Drive Similar)

Tools Required

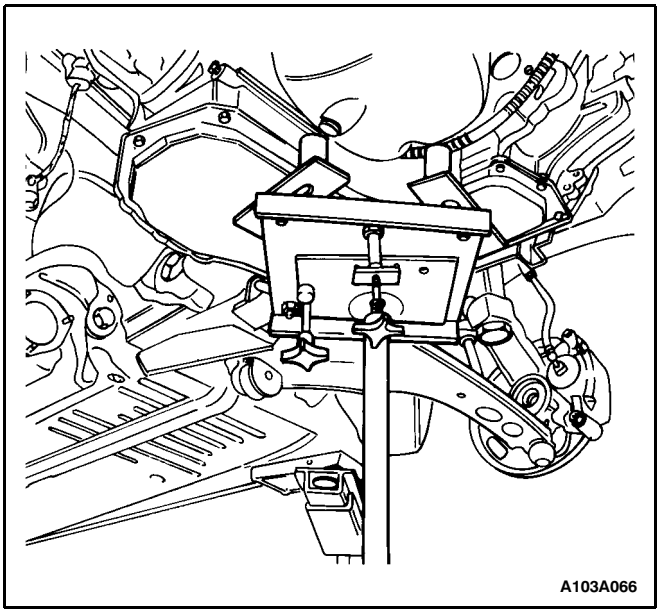
J-28467-B Engine Support Fixture

Removal Procedure

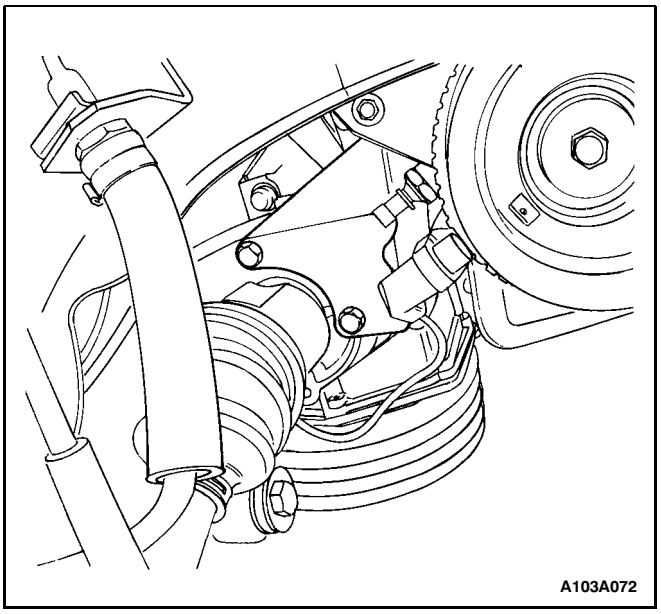


A103A071

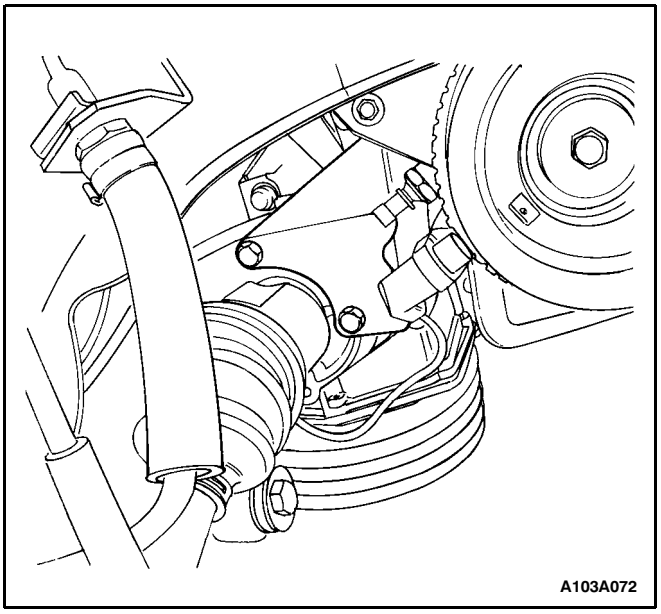
1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Remove the right front wheel. Refer to Section 2E, Tires and Wheels.
4. Remove the right splash shield. Refer to Section 9N, Frame and Underbody.
5. Install the engine support fixture J-28467-B.


A103A066

6. Install the transaxle support jack.



7. Remove the side transaxle mounting bolts.
8. Remove the engine mounting bolts.
9. Remove the transaxle brace.



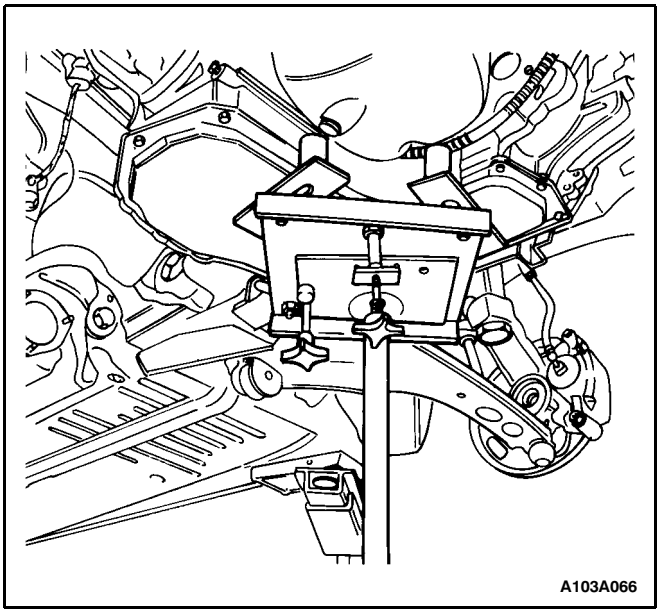
Installation Procedure

1. Install the transaxle brace.
2. Loosely install the side transaxle mounting bolts.
3. Install the engine mounting bolts.

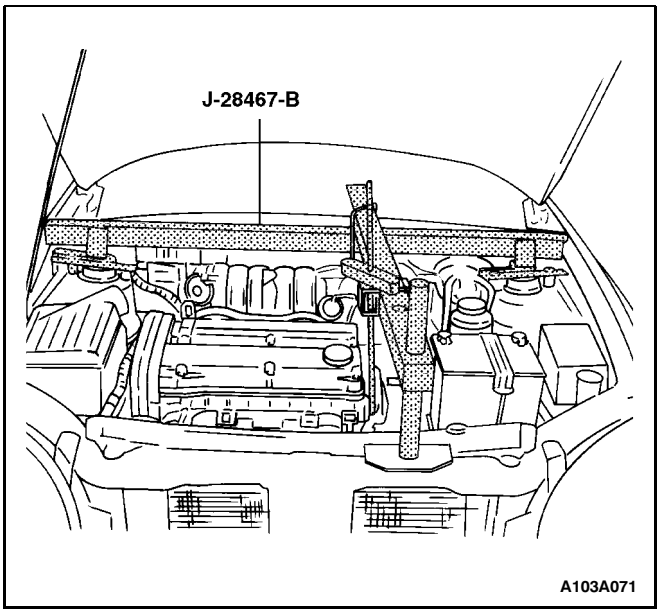
Tighten

Tighten the transaxle mounting bolts to 75 N•m (55 lb-ft).

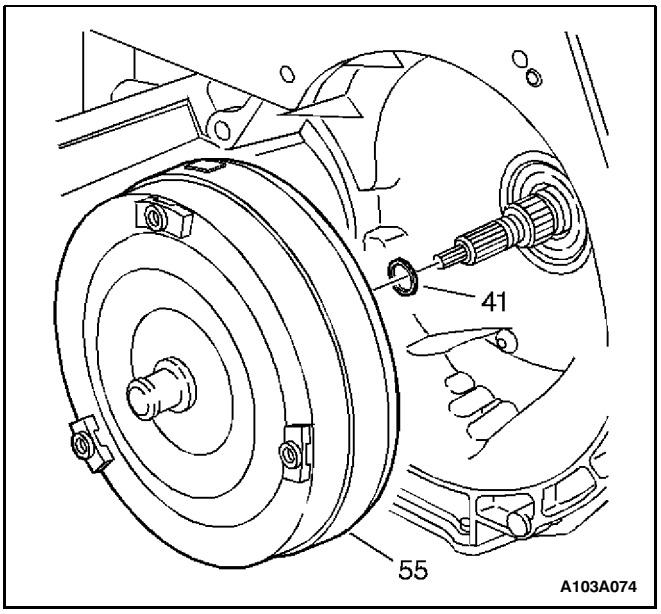
Tighten the engine mounting bolts to 75 N•m (55 lb-ft).



4. Remove the transaxle support jack.



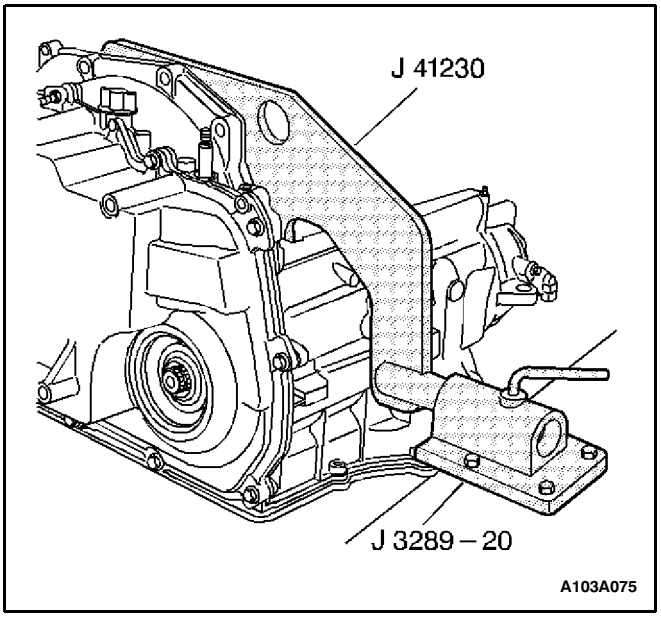
5. Remove the engine support fixture J-28467-B.
6. Install the right splash shield. Refer to Section 9N, Frame and Underbody.
7. Install the right front wheel. Refer to Section 2E, Tires and Wheels.
8. Lower the vehicle.
9. Connect the negative battery cable.



UNIT REPAIR

TORQUE CONVERTER REMOVAL

1. Remove the torque converter assembly (55).
2. Remove the turbine shaft O-ring (41) from the end of the turbine shaft.



TRANSAXLE HOLDING FIXTURE ASSEMBLY

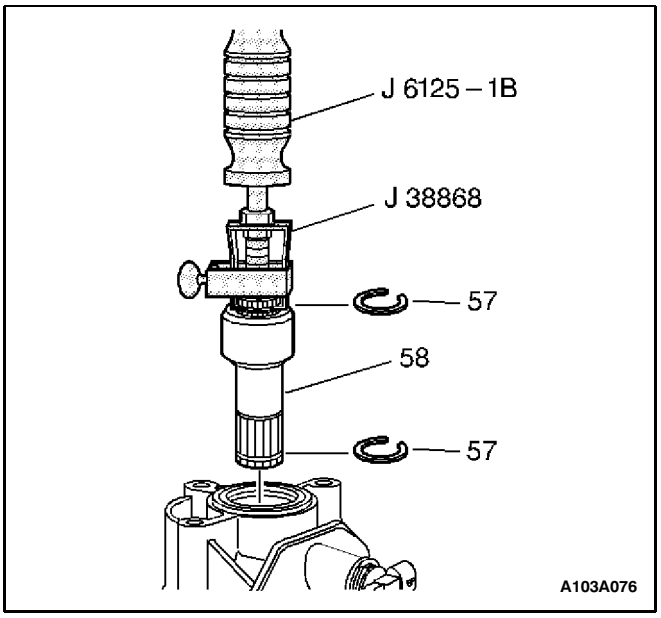
Tools Required

J 41230 Transmission Support Fixture

J 3289-20 Support Fixture

Caution: To reduce the possibility of personal injury or transmission damage, make sure, when doing the next step, that all of the bolts for the support fixture are installed as shown, and that the bolts are tightened to 11 N•m (98 lb-in).

1. Install the J 41230 transmission support fixture onto the transmission.
2. Torque the support fixture bolts to 11 N•m (8 lb-ft.)
3. Install the transmission and the support fixture onto the J 3289-20 fixture base.
4. Position the transmission with the side cover facing down.
5. Insert the pin into the J 3289-20 fixture base in order to lock the unit into place.



STUB SHAFT REMOVAL

Tools Required

J 6125-1B Slide Hammer

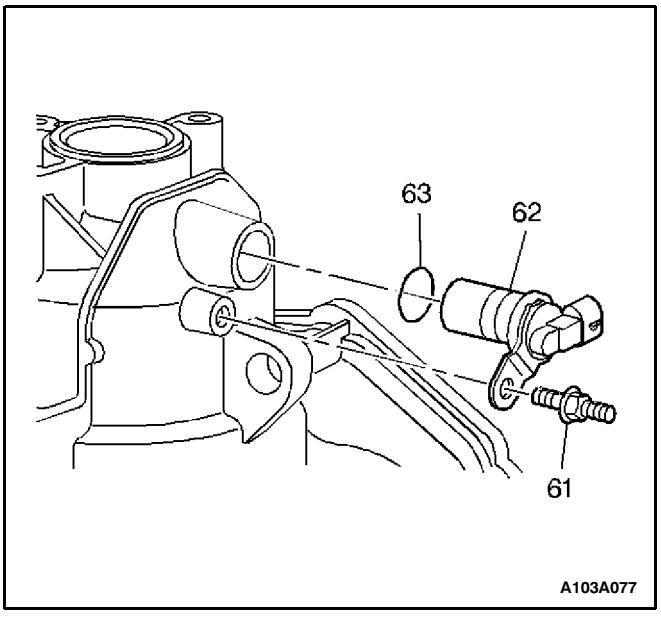
J 38868 Shaft Remover

Important: Handle the stub shaft carefully. The stub shaft sleeve is reusable if the sleeve is not damaged or removed from the stub shaft. Damage to the stub shaft sleeve will result in a transmission fluid leak.

1. **Remove and discard the snap ring (57) from the end of the stub shaft (68). The stub shaft snap ring is not reusable.**
2. **Attach the J 6125-1B to the J 38868. Install the J 38868 into the snap ring groove on the stub shaft (58). Tighten the J 38868 securely to the stub shaft.**
3. **Pull lightly on the shaft and rotate it until the stub shaft snap ring at the differential seats in the taper on the differential side gear.**

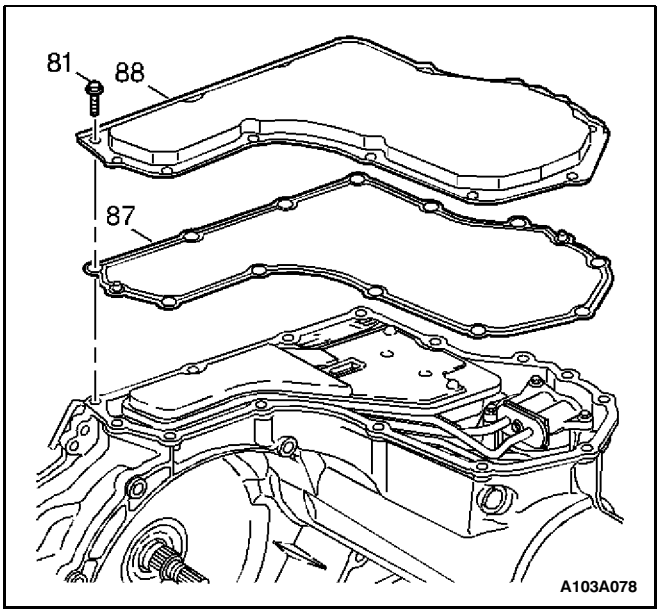
Important: Confirm that the stub shaft snap ring (57 is properly seated in the differential side gear. If not, damage may occur to the transmission when you attempt to remove the stub shaft (58).

4. **Pull the stub shaft (58) out with the slide hammer impact.**



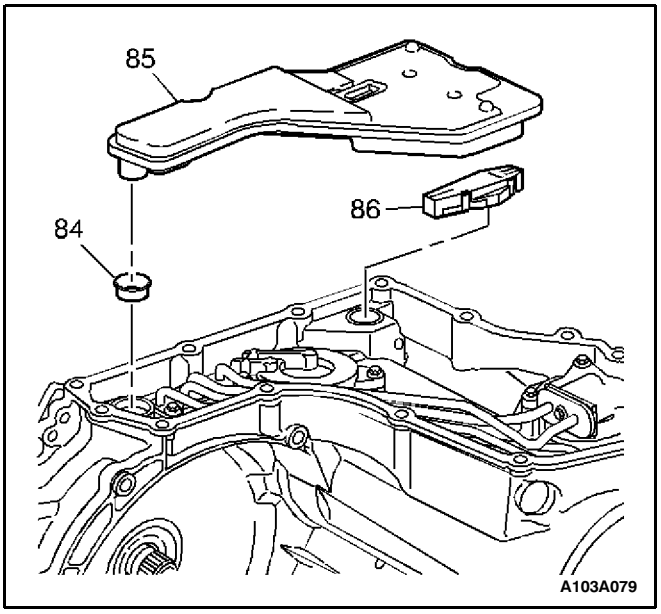
AUTOMATIC TRANSMISSION OUTPUT SPEED SENSOR (A/T OSS) REMOVAL

1. **Rotate the transmission so that the case side cover is facing upward in order to drain the transmission fluid through the stub shaft end of the transmission.**
2. **Rotate the transmission with the oil pan facing upward.**
3. **Remove the output speed sensor stud (61).**
4. **Remove the output speed sensor assembly (62). Pull the speed sensor assembly straight out from the transmission case in order to prevent damage to the case bore.**
5. **Remove the O-ring (63).**



OIL PAN AND GASKET REMOVAL

1. Remove the twelve oil pan bolts (81).
2. Remove the oil pan (88). The magnet can remain in the oil pan.
3. Remove the oil pan gasket (87). The oil pan gasket is reusable.

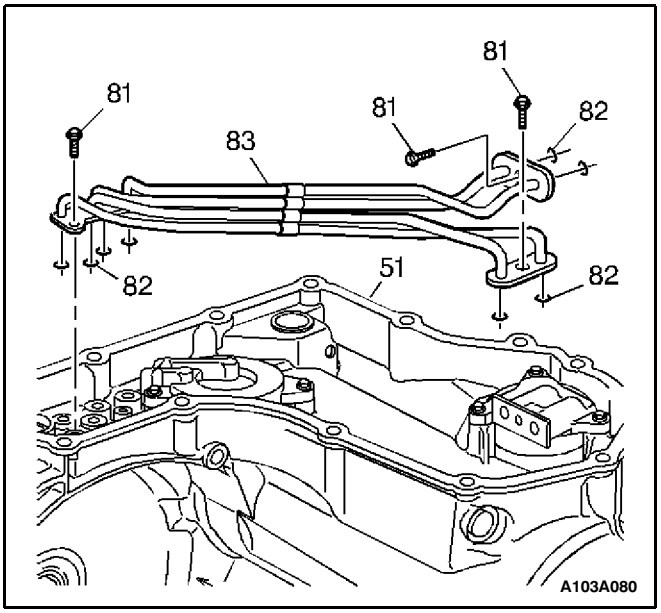


OIL FILTER/SEAL, OIL LEVEL CONTROL VALVE REMOVAL

1. Remove the transmission filter assembly (85).

Important: You may use a small screwdriver in order to pry the seal from case. Be careful not to score or damage the case with the screwdriver.

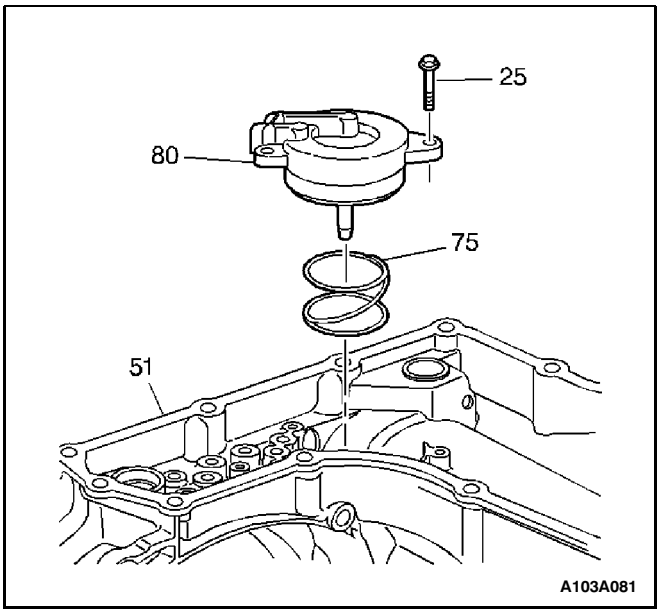
2. Remove the filter neck seal (84) from the transmission case. The filter neck seal (84) is not reusable and should be discarded.
3. Remove the oil level control valve (86).



OIL FEED PIPES REMOVAL

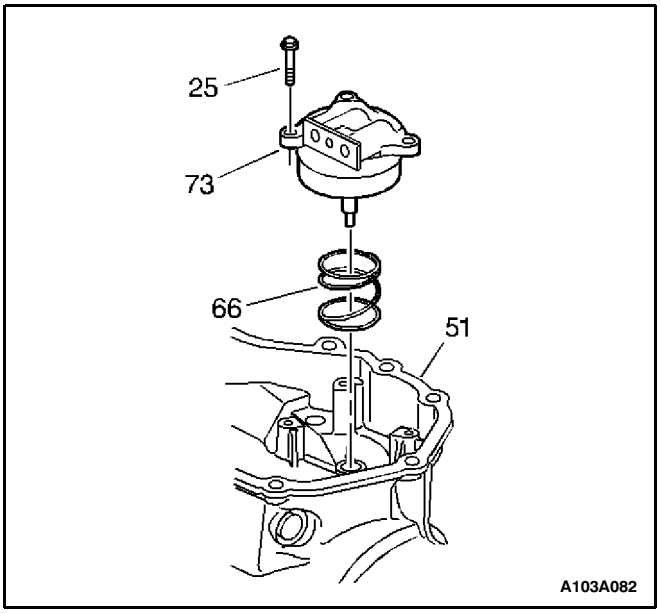
Important: The feed pipe seal rings (82) are glued into place and should remain with the feed pipe assembly (83). The feed pipe seal rings are reusable.

Remove the four oil feed pipe bolts (81) and remove the oil feed pipe assembly (83).



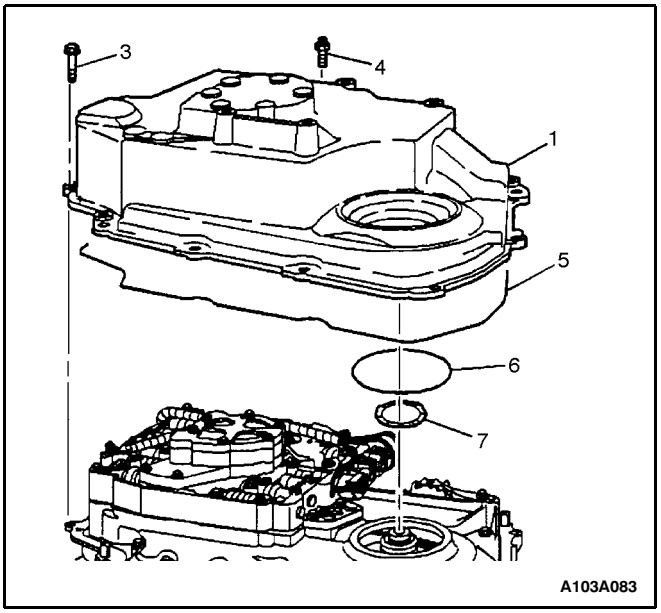
INTER 4TH SERVO REMOVAL

1. Remove the three servo cover bolts (25).
2. Remove the servo cover (intermediate/fourth) (80) assembly.
3. Remove the servo return spring (75).



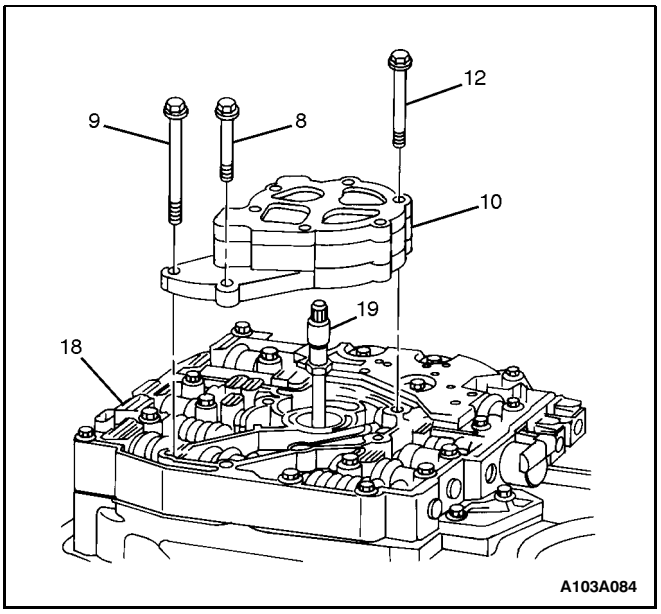
LOW/REVERSE SERVO REMOVAL

1. Remove the three servo cover bolts (25).
2. Remove the servo cover (Lo/Reverse) (73).
3. Remove the servo return spring (66).



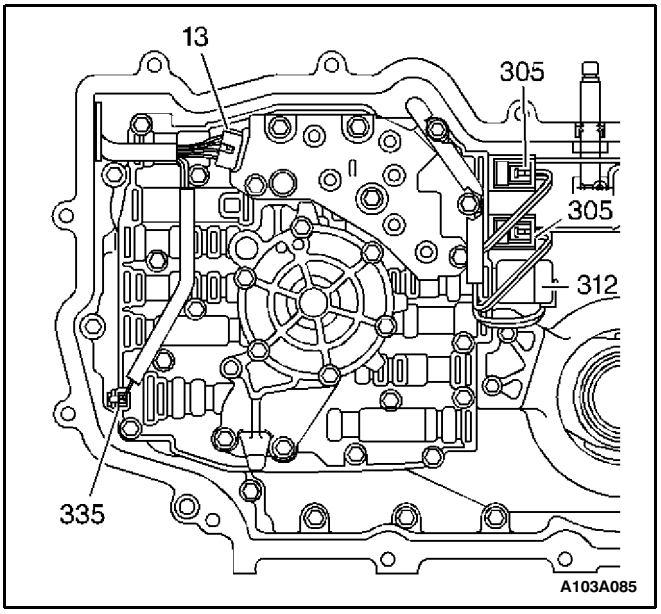
CASE SIDE COVER REMOVAL

1. Rotate the transmission so that the side cover faces upward.
2. Remove the 11 side cover bolts (3) or studs (4) (model dependant).
3. Remove the transmission side cover (1).
4. Remove the two side cover gaskets (5 and 6) and the side cover to driven support thrust washer (7), if they did not remain with the side cover.



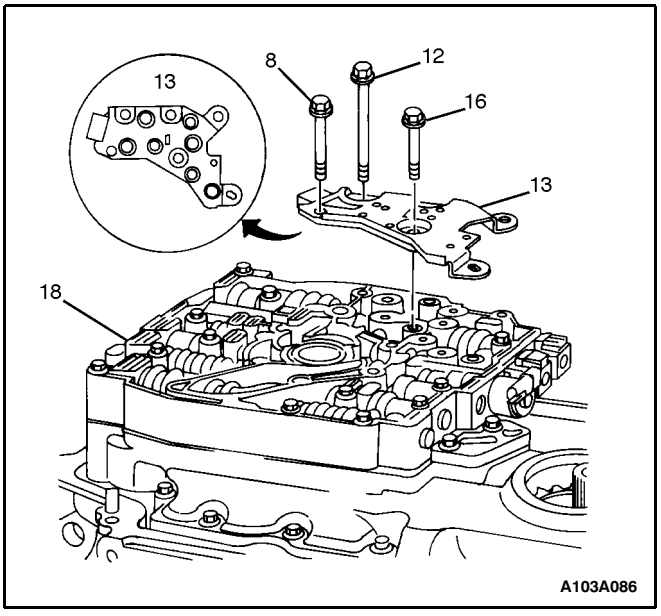
OIL PUMP AND OIL PUMP SHAFT REMOVAL

1. Remove the eight bolts from the oil pump (8, 9 and 12).
2. Remove the oil pump assembly (10).
3. Remove the oil pump shaft (19).



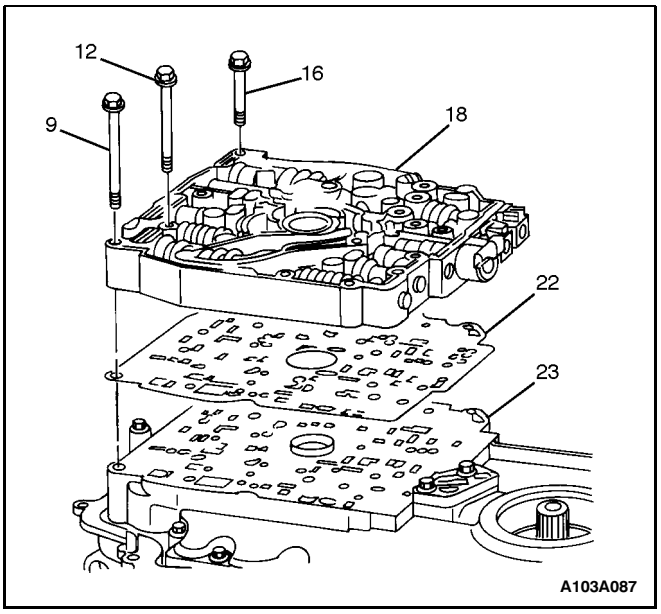
WIRE HARNESS DISCONNECT

1. Disconnect the wiring harness connectors from the pressure control solenoid (312).
2. Disconnect the wiring harness connectors from the 1-2 and 2-3 shift solenoids (305).
3. Disconnect the wiring harness connectors from the pressure switch assembly (13).
4. Disconnect the wiring harness connectors from the TCC solenoid (335).



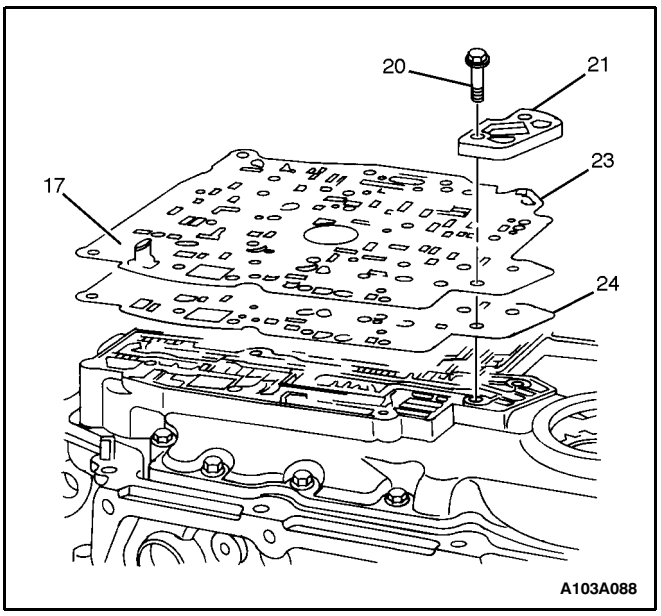
PRESSURE SWITCH ASSEMBLY REMOVAL

1. Remove the six bolts from the pressure switch assembly (8, 12 and 16).
2. Remove the pressure switch assembly (PSA) (13) from the control valve body assembly (18). The seven pressure switch O-rings are reusable and should remain with the pressure switch assembly.



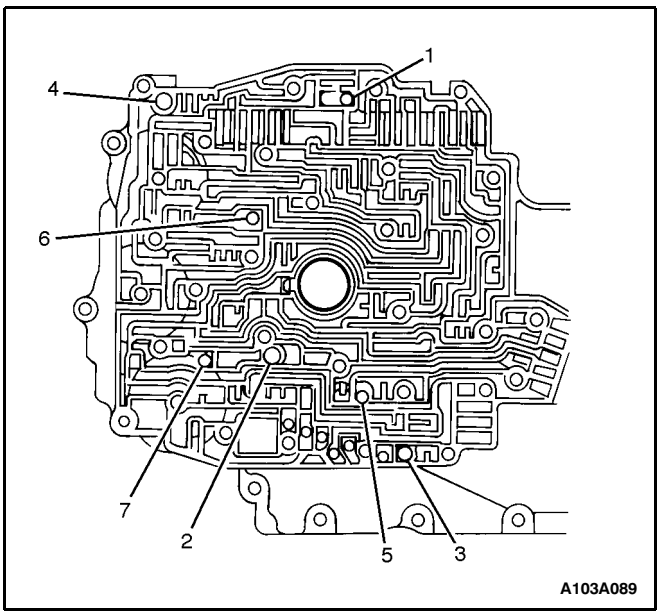
CONTROL VALVE BODY ASSEMBLY AND GASKET REMOVAL

1. Remove the remaining twelve bolts (8, 12 and 16) from the control valve body assembly (18).
2. Remove the control valve body assembly (18).
3. Remove and discard the valve body to spacer plate gasket (22).



SPACER PLATE AND GASKET REMOVAL

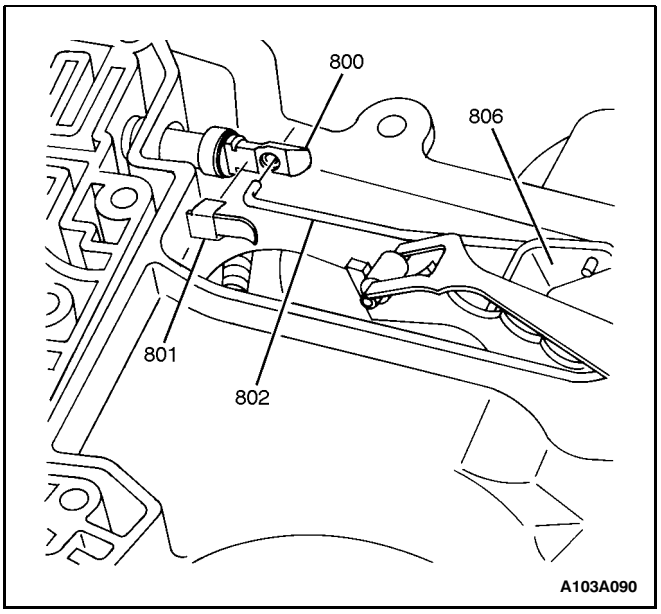
1. Remove the two spacer plate support bolts (20).
2. Remove the spacer plate support (21).
3. Remove the spacer plate (23) with the spacer plate filter (17) attached.
4. Remove and discard the spacer plate to channel plate gasket (24).



CHECKBALL REMOVAL

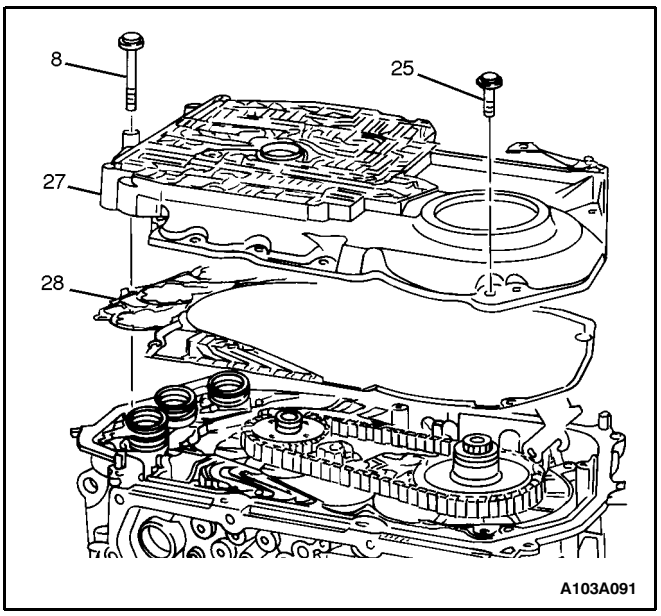
Important: Do not use a magnet in order to remove the checkballs. The magnet may magnetize the checkballs, and the checkballs may attract metallic particles.

Remove the seven checkballs (26) in the channel plate.



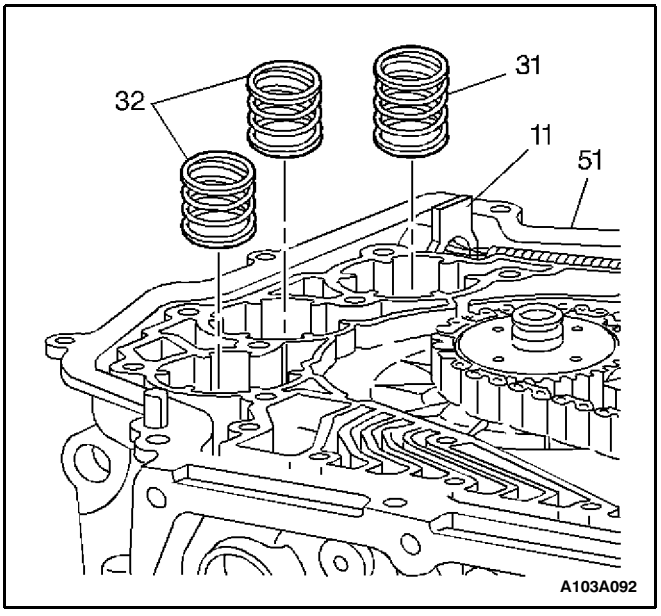
MANUAL VALVE CLIP REMOVAL

1. Disconnect the manual valve clip (801) from the manual valve.
2. Disconnect the manual valve link (802) from the manual valve.



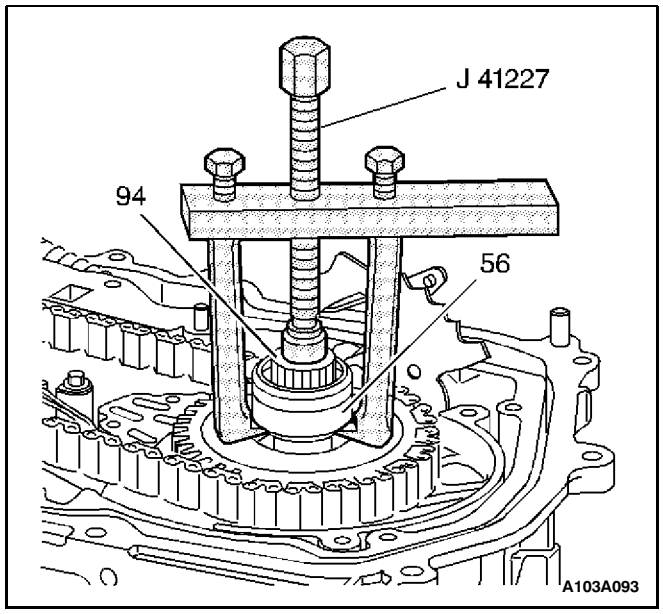
CHANNEL PLATE AND GASKET REMOVAL

1. Remove the ten channel plate bolts (8 and 25).
2. Remove the channel plate assembly (27). Keep the following components with the channel plate:
   - The drive sprocket to channel plate thrust washer (34).
   - The three accumulator pistons (29)
   - The manual valve (800)
   - The detent lever spring (804) and bolt (805)
3. Remove and discard the channel plate to case gasket (28).



ACCUMULATOR SPRING REMOVAL

Remove the three accumulator springs (31 and 32) from the case.



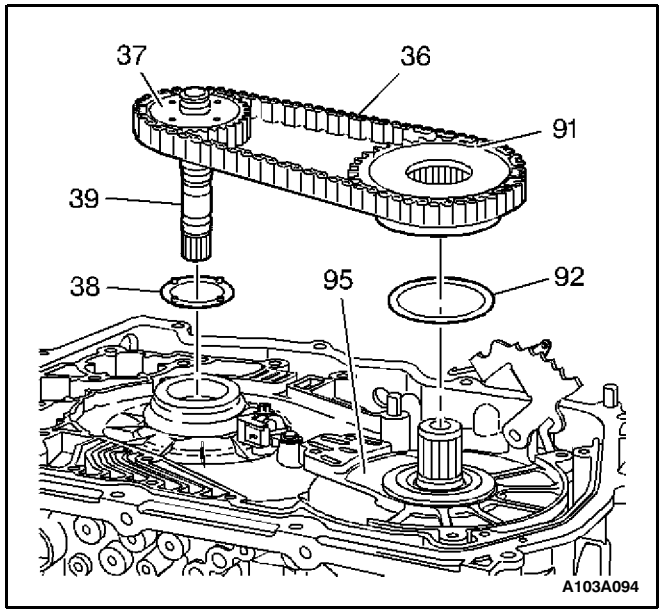
OUTPUT SHAFT SLEEVE REMOVAL

Tools Required

J 41227 Output Shaft Sleeve Puller

Important: Do not remove the output shaft (94) in the same manner as the stub shaft. In order to remove the output shaft (94), you must completely disassemble the transmission. Removing the output shaft (94) at this time will damage other transmission components.

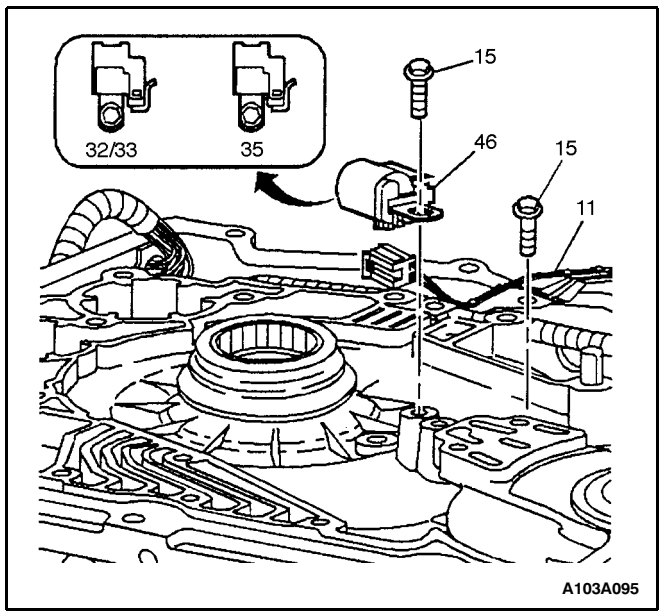
1. **Insert the legs of J 41227 under the output shaft sleeve (56).**
2. **Tighten the center bolt of the J 41227 down in order to pull the output shaft sleeve (56) off the output shaft (94).**
3. **Remove and discard the output shaft sleeve (56). Use the J 41227. The output shaft sleeve is not reusable.**



DRIVE, DRIVEN SPROCKETS, DRIVE LINK REMOVAL

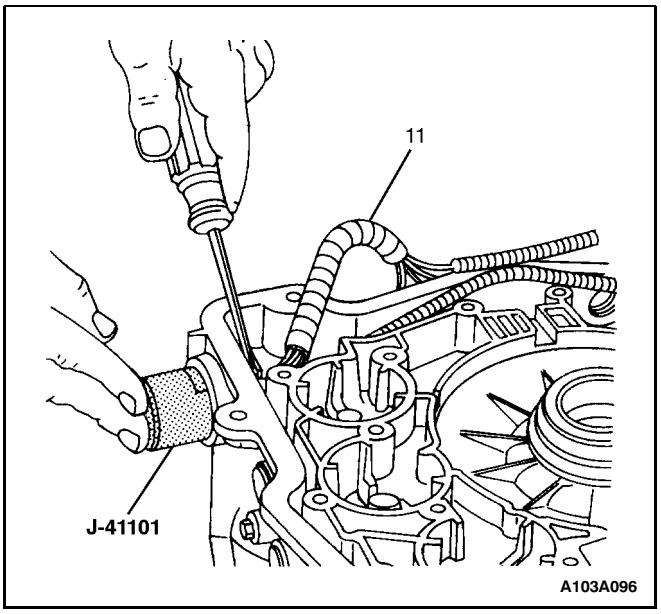
Important: When removing the drive link assembly (36) note which direction the chain faces. You must later install the chain in the same direction in order to prevent excessive noise.

1. **Remove, as an entire unit, the drive sprocket (37), the turbine shaft (39), the driven sprocket (81) and the drive link assembly (36).**
2. **If the drive sprocket to drive sprocket support thrust washer (38) has not remained with the drive sprocket assembly (37 and 39), remove the drive sprocket to drive sprocket support thrust washer (38). The driven sprocket to driven sprocket support thrust washer (92) should remain with the driven sprocket support assembly (95).**



INPUT SPEED SENSOR REMOVAL

1. **Remove the wiring harness connector at the input speed sensor (46).**
2. **Remove the input speed sensor bolt (15) and the input speed sensor (46).**
3. **Remove the wire retainer slip bolt (15) and retainer clip.**

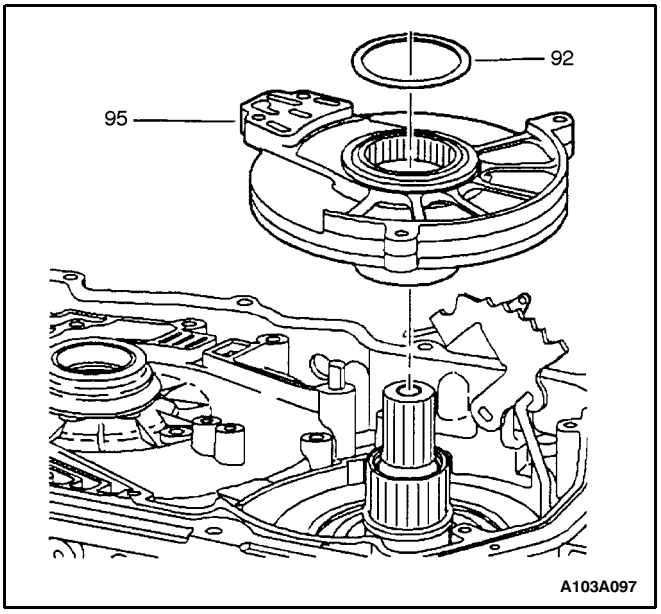


WIRING HARNESS REMOVAL

Tools Required

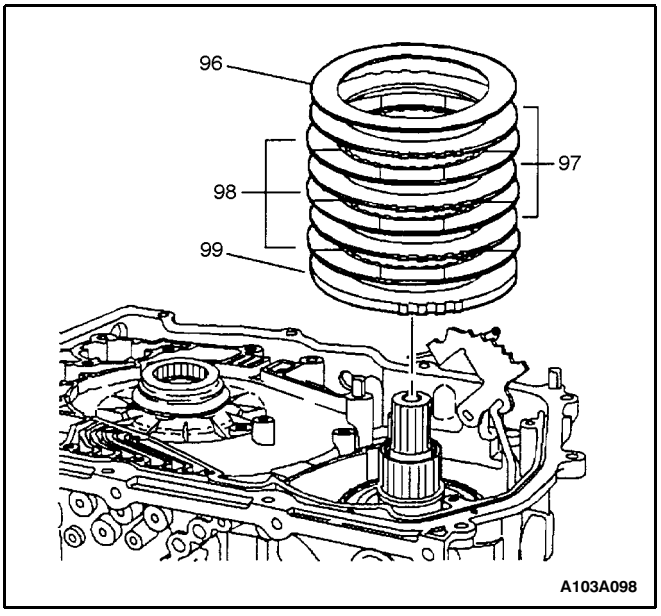
J 41101 Pass-Through Connector Remover

1. **Push the J 41101 onto the pass-through connector from the outside of the transmission case in order to compress the pass-through connector's retaining tabs.**
2. **With the retaining tabs compressed, use a screwdriver in order to remove the pass-through connector through the inside of the transmission case.**
3. **Remove the wiring harness (11).**



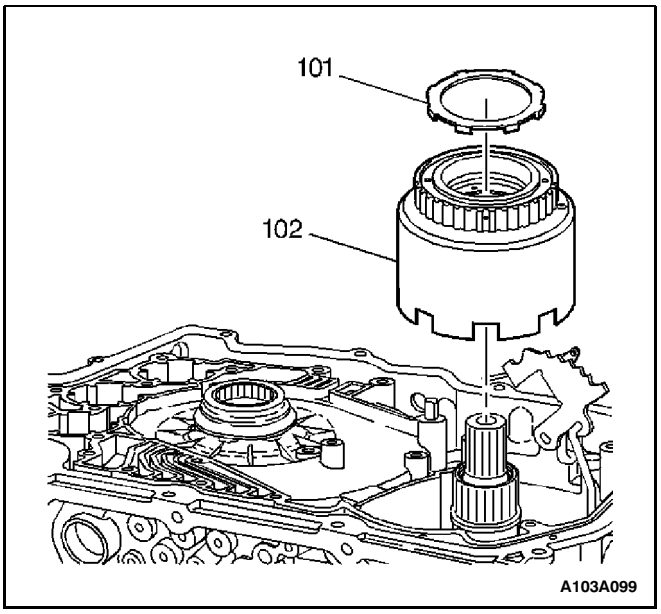
DRIVEN SPROCKET SUPPORT ASSEMBLY REMOVAL

1. **Remove the driven sprocket to driven sprocket support thrust washer (92).**
2. **Remove the driven sprocket support assembly (95).**



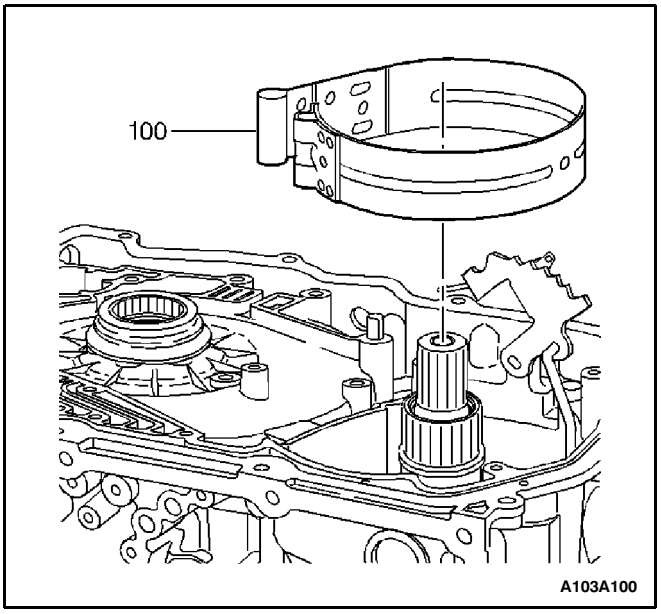
2ND CLUTCH PLATES REMOVAL

1. **Remove the 2nd clutch wave plate (96).**
2. **Remove the three 2nd clutch steel plates (97).**
3. **Remove the three 2nd clutch fiber plates (98).**
4. **Remove the backing plate (99).**



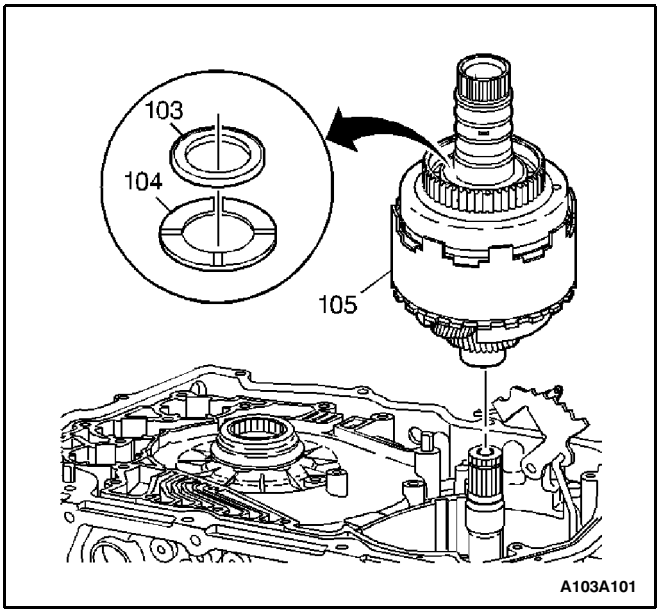
REVERSE INPUT CLUTCH HOUSING REMOVAL

1. **Remove the driven sprocket support to reverse clutch housing thrust washer (101).**
2. **Remove the reverse input clutch housing and the 2nd roller clutch assembly (102).**



INTERMEDIATE 4TH BAND REMOVAL

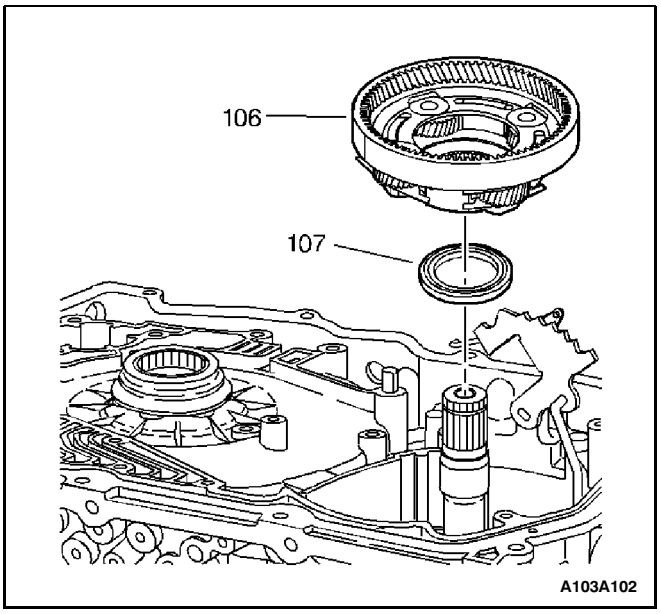
Remove the intermediate 4th band (100).



DIRECT/COAST CLUTCH AND REACTION GEAR SET REMOVAL

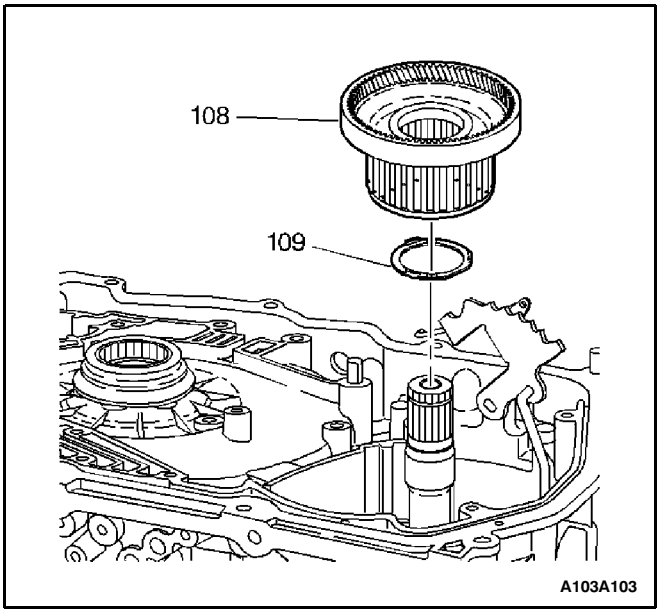
Important: Keep the bearing assembly (103) and the selective thrust washer (104) on top of the direct/coast clutch and reaction carrier assembly (105).

Remove the direct/coast clutch and reaction carrier assembly (105).



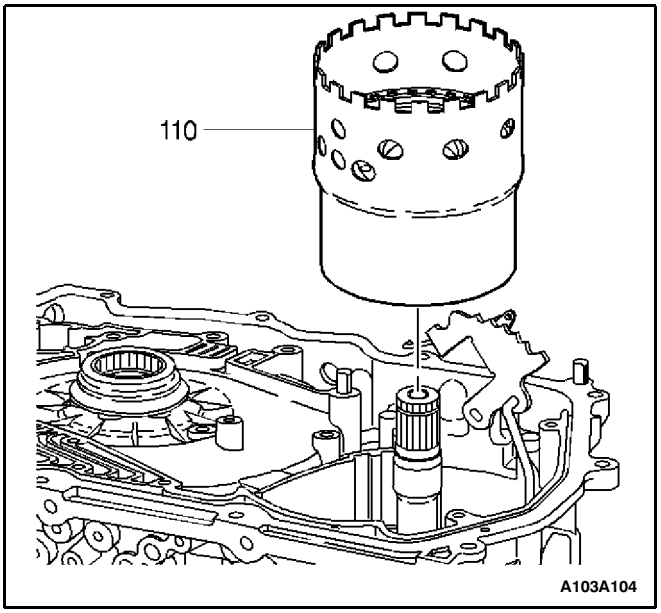
INPUT CARRIER AND REACTION GEAR ASSEMBLY REMOVAL

1. Remove the input carrier and reaction internal gear assembly (106). A bearing assembly is permanently inside the input carrier.
2. Remove the input carrier to forward clutch hub thrust bearing (107). The input carrier to forward clutch hub thrust bearing may have remained with the input carrier.



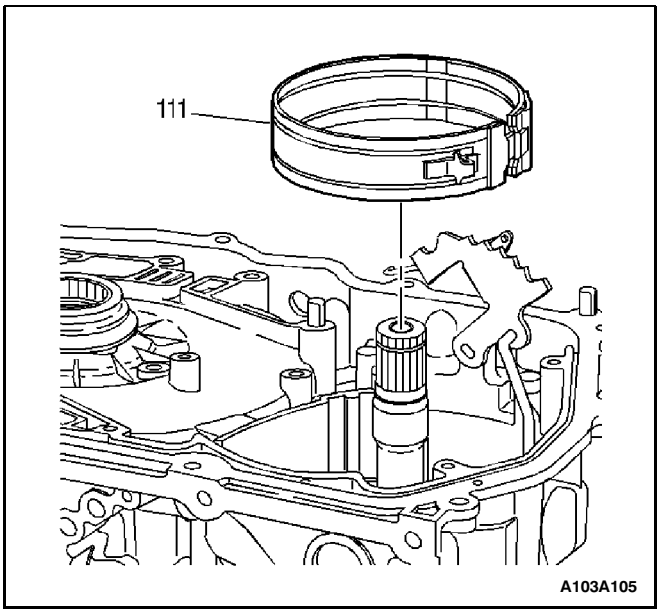
INPUT INTERNAL GEAR, FORWARD CLUTCH HUB REMOVAL

1. Remove the input internal gear and forward clutch hub assembly (108).
2. If the forward clutch hub to race thrust washer (109) did not remain with the forward clutch hub, remove the forward clutch hub to race thrust washer (109).

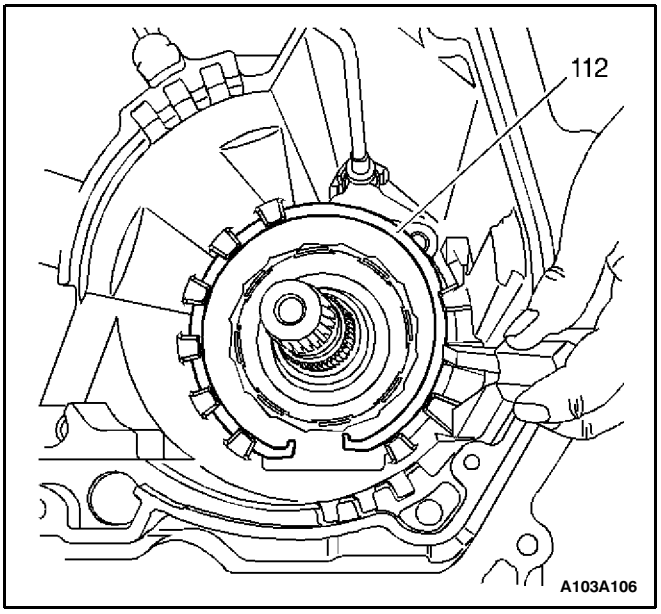


FORWARD CLUTCH AND LOW/REVERSE BAND REMOVAL

1. Remove the forward clutch assembly (110).



2. Remove the low/reverse band (111).



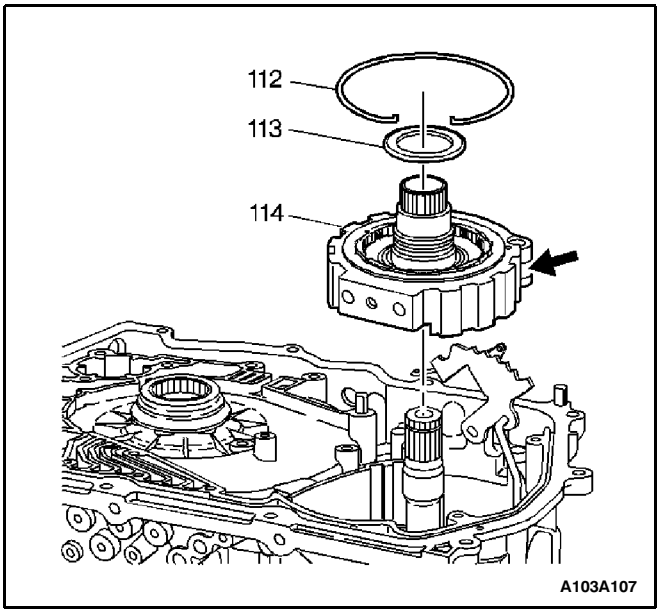
FORWARD CLUTCH SUPPORT, LOW ROLLER CLUTCH REMOVAL

Tools Required

J28585 Snap Ring Screwdriver

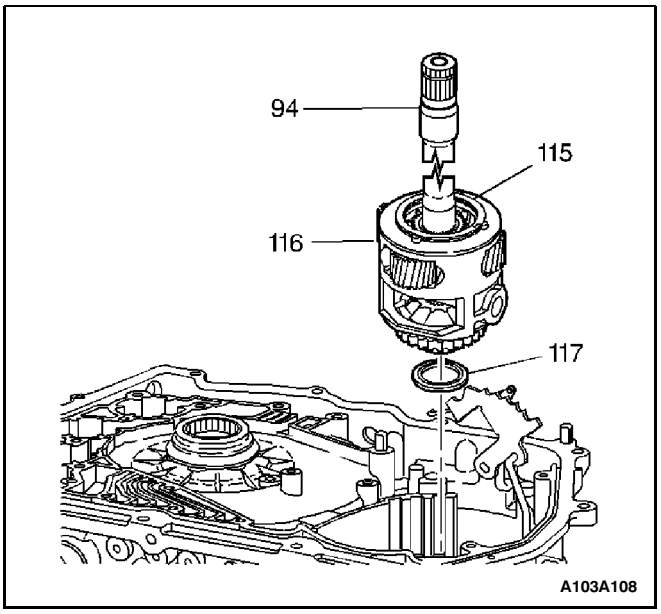
Important: The snap ring opening must be at the bottom of the transmission case. If the snap ring opening is out of position, inspect the transmission case for damage.

1. Remove the forward clutch support snap ring (112) from the transmission case. Use the J 28585.



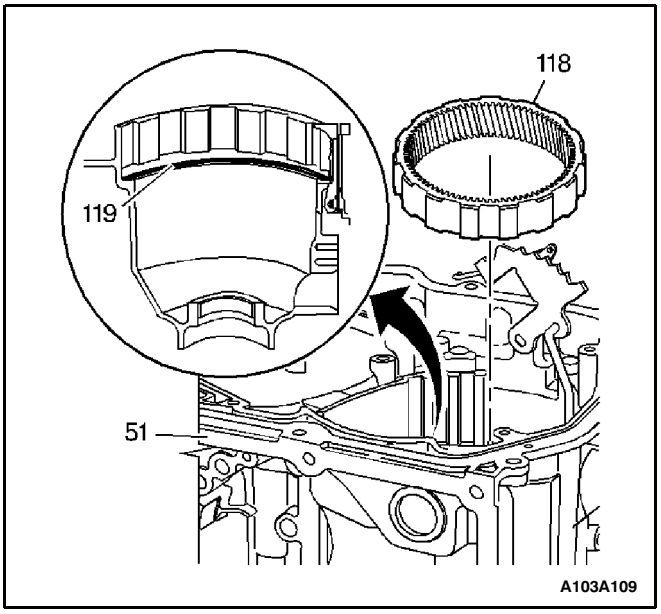
Important: You may need to depress the parking pawl in order to remove the forward clutch support.

2. Remove the forward clutch support and the low roller clutch assembly (114). Keep the forward clutch housing to the forward clutch support thrust bearing (113) with the forward clutch support assembly (114).



OUTPUT SHAFT AND FINAL DRIVE ASSEMBLY REMOVAL

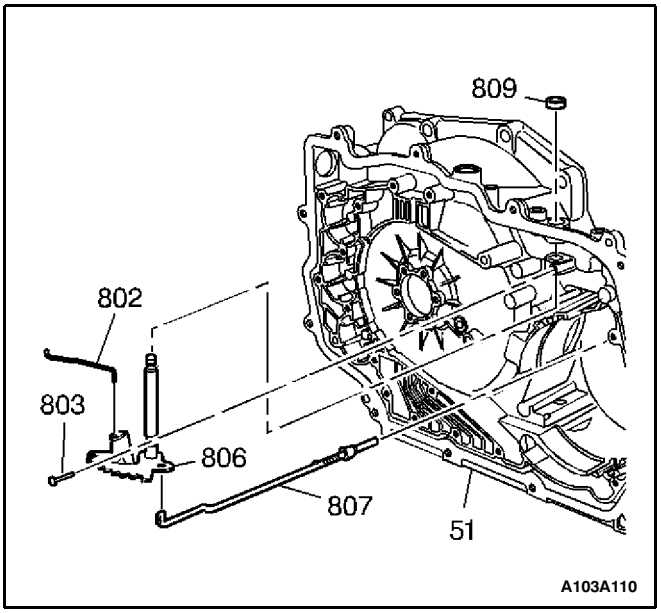
1. Remove, as one unit, the output shaft (94), the final drive assembly (116), and the final drive sun gear (115).
2. If the differential carrier to case thrust bearing (117) did not remain with the final drive assembly (116), remove the differential carrier to case thrust bearing (117).



FINAL DRIVE INTERNAL GEAR REMOVAL

Important: The fretting ring (119) is in the case ring groove. Do not remove the fretting ring unless it appears damaged.

Remove the final drive internal gear (118).



MANUAL SHAFT, DETENT LEVER, PARK LOCK REMOVAL

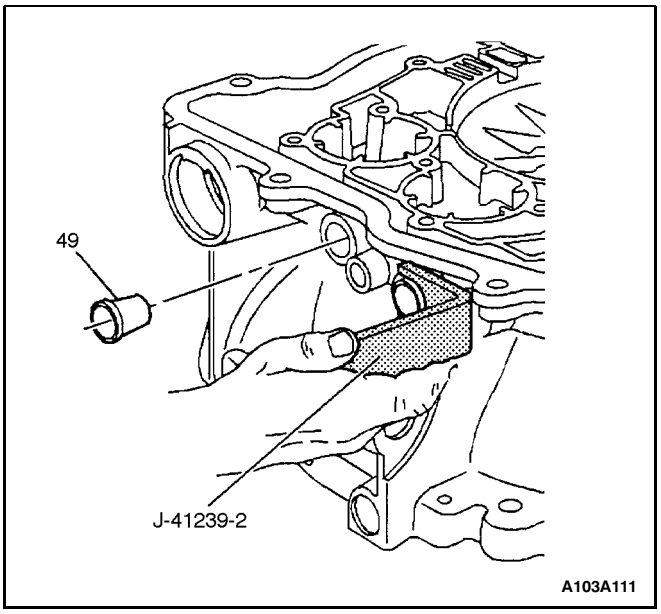
1. Remove the manual shaft to transmission case pin (803).

Important: The parking lock actuator assembly (807) remains attached to the manual shaft and detent lever until the assembly is removed.

2. Remove the manual shaft and detent lever assembly (806) by pushing the manual shaft into the transmission case (51). The parking lock actuator assembly (807) remains attached to the detent lever until you remove the manual shaft and detent lever assembly.

Important: Do not damage the case bore during removal of the manual shaft seal (809).

3. Remove the manual shaft seal (809) from the case (51).

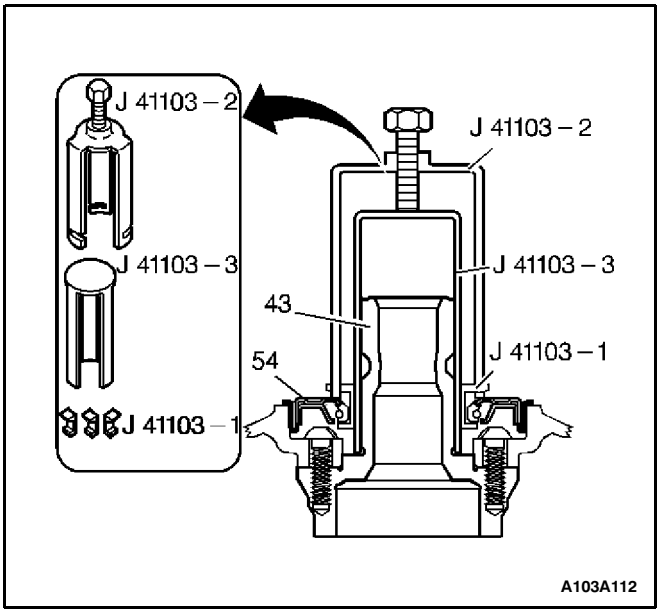


TRANSAXLE COOLER LINE SEAL REMOVAL

Tools Required

J 41239-2 Cooler Line Seal Removal Tool

1. **Use a hammer in order to wedge the J 41239-2 into the transmission cooler line seal (49) on the outside of the case bore.**
2. **Remove the transmission cooler line seal by prying the transmission cooler line seal out of the case. If necessary strike the J 41239-2 with a hammer.**



TORQUE CONVERTER SEAL REMOVAL

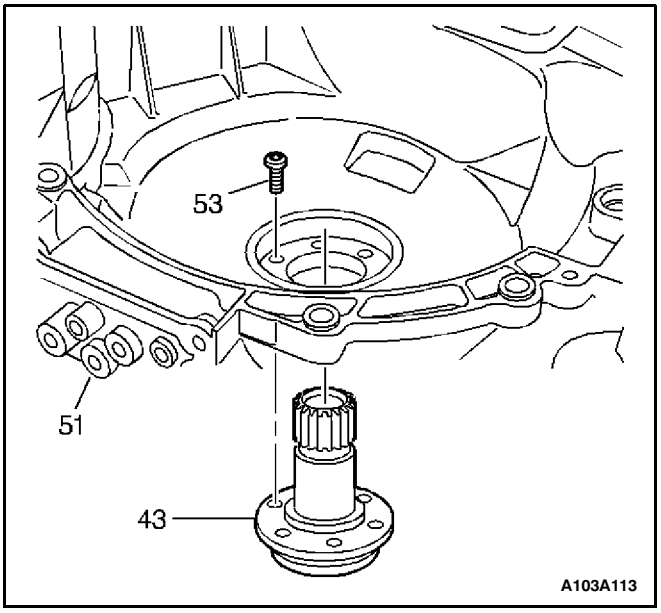
Tools Required

J 41103 Torque Converter Seal Remover

1. **Insert the three J 41103 puller legs under the torque converter seal (54).**
2. **Insert the J 41103 support body over the stator shaft (43).**
3. **Insert the J 41103 puller bridge over the J 41103 support body. Connect the J 41103 puller legs into the slots on the J 41103 bridge.**

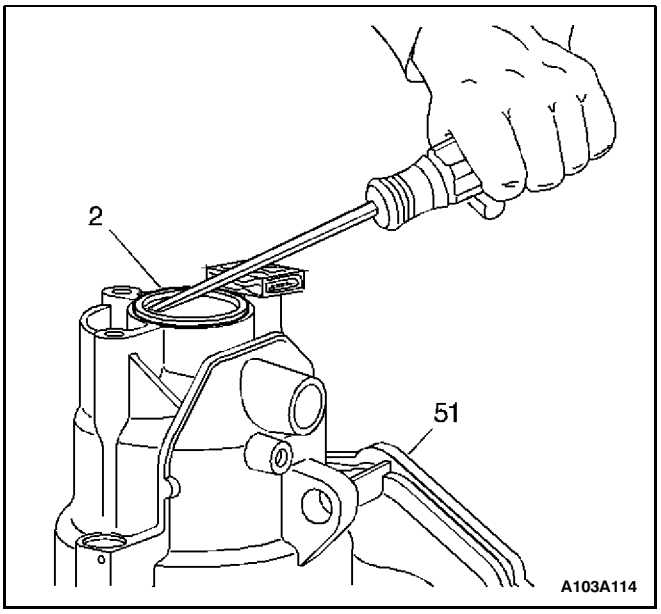
Important: The puller legs will damage the torque converter seal (54). Discard the torque converter seal (54) after removal.

4. **Tighten the forcing screw on the J 41103 puller bridge until the J 41103 puller legs remove the torque converter seal (54).**



DRIVE SPROCKET SUPPORT REMOVAL

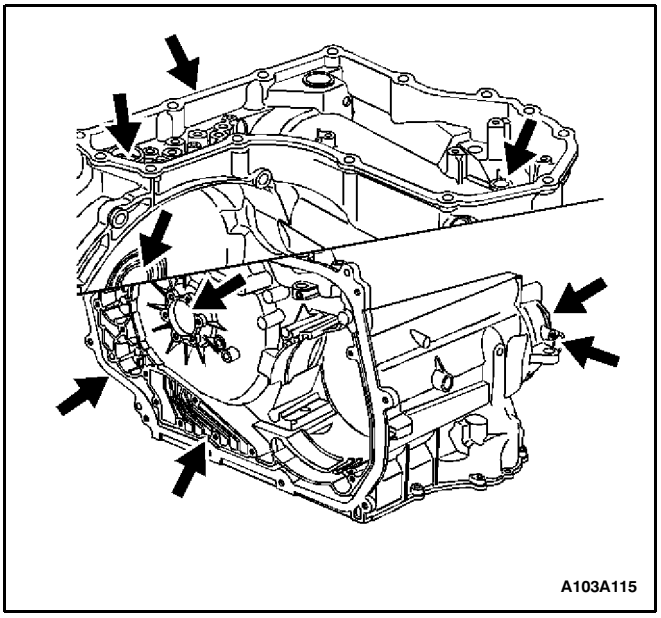
1. **Remove the six bolts (53) from the drive sprocket support (43).**
2. **Remove the drive sprocket support (43 from the case (51).**



RIGHT HAND AXLE SEAL REMOVAL

Important: Be careful not to damage the case bore with the screwdriver.

Use a screwdriver in order to remove the right hand axle seal (2) from the transmission case (51). If necessary, crush the right hand axle seal first with the screwdriver in order to loosen the seal from the case.

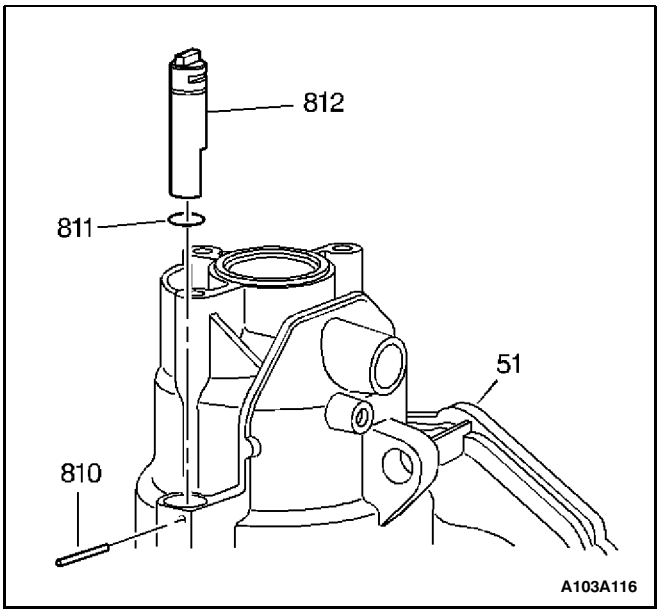


CASE INSPECTION

Notice: Use Transjel™ J 36850 or equivalent during assembly in order to retain checkballs or to lubricate components. Greases other than the recommended assembly lube will change the transmission fluid characteristics and will cause undesirable shift conditions or filter clogging.

Important: After cleaning the transmission case, allow the case to air dry. Do not use cloth or paper towels in order to dry the transmission case or any other transmission components. Lint from the towels can cause component failure.

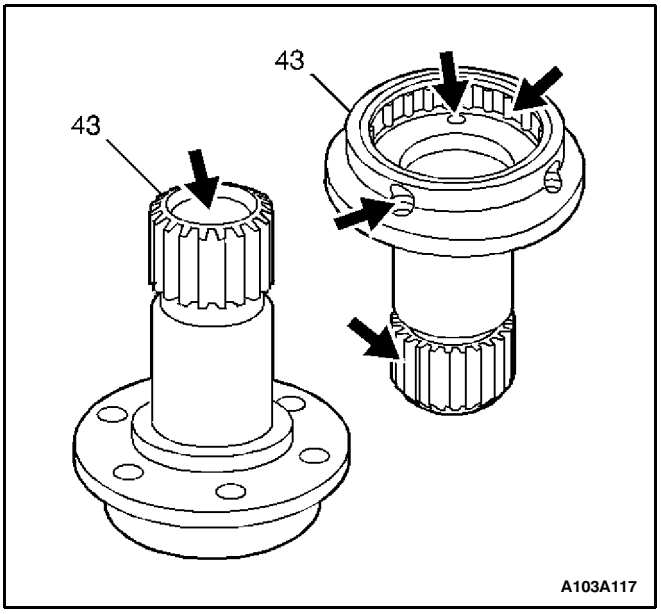
1. **Thoroughly clean the transmission case and all the case threads with solvent.**
2. **Inspect the case exterior and the external bores for cracks, sharp edges, porosity and excessive bushing wear.**
3. **Inspect the case interior for damage at the snap ring grooves, case lugs and band anchor pin.**
4. **Inspect all the gasket surfaces for surface damage and in order to ensure surface flatness.**
5. **Inspect the corresponding gasket for proper impressions in order to ensure surface flatness.**
6. **Inspect the bolt holes and fasteners for thread damage. If necessary, repair or replace any bolt holes or fasteners.**
7. **Air check the oil passages. For identification of the oil passages, refer to the transmission diagnosis section.**



ACTUATOR GUIDE REPLACEMENT

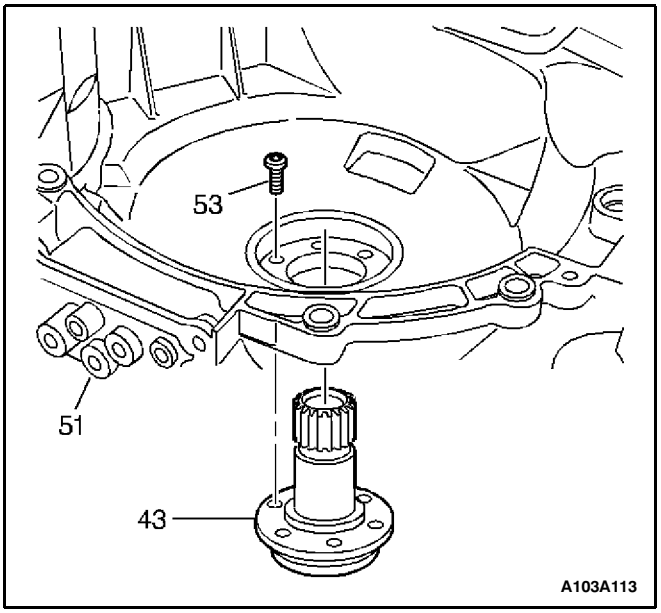
Important: Do not remove the actuator guide unless the actuator guide appears damaged.

1. **Remove the actuator guide roll pin (810) from the case.**
2. **Remove the actuator guide (812) and O-ring seal (811) assembly from the case (51). For easiest removal, tap the actuator guide (812) into the case (51).**
3. **Install a new O-ring seal (811) on the actuator guide (812).**
4. **Install the actuator guide (812) and O-ring assembly (811) into the transmission case (51).**
5. **Install the actuator guide roll pin (810) into the case (51) in order to secure the actuator guide (812).**

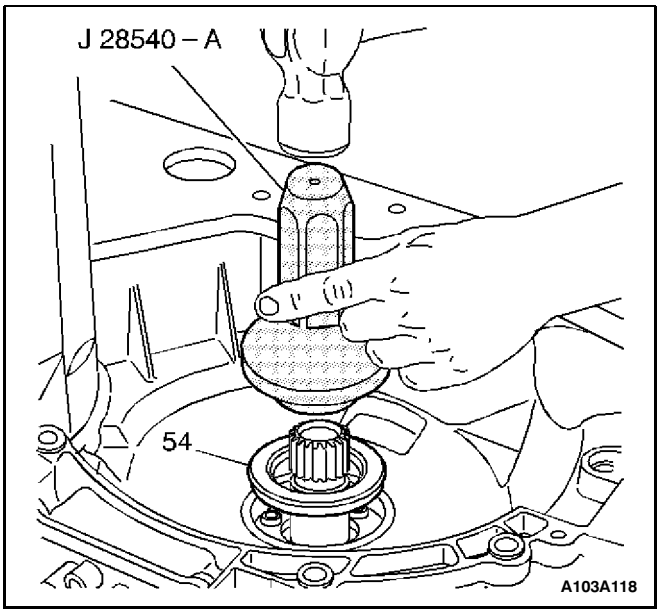


DRIVE SPROCKET SUPPORT INSTALLATION

1. **Inspect the drive sprocket support (43) for damage to the stator shaft splines, the journals, the bushings, and the roller bearing.**
2. **Inspect the converter seal drain holes for blockage.**



3. **Install the drive sprocket support (43) into the bell housing of the transmission case.**
4. **Install the six drive sprocket support bolts (53) into the drive sprocket support (43).**
5. **Hand start the bolts and tighten the bolts to 12 N•m (9 lb-ft).**

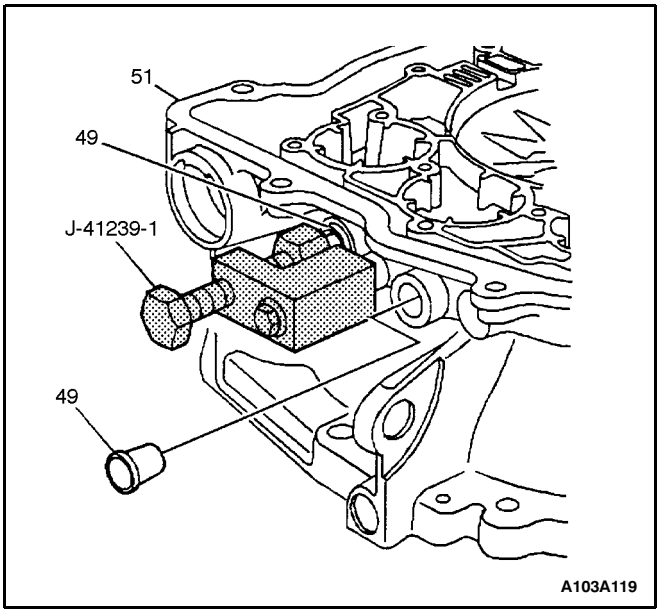


TORQUE CONVERTER SEAL INSTALLATION

Tools Required

J 28540 Torque Converter Seal Installer

Install a new torque converter seal (54). Use the J 28540.

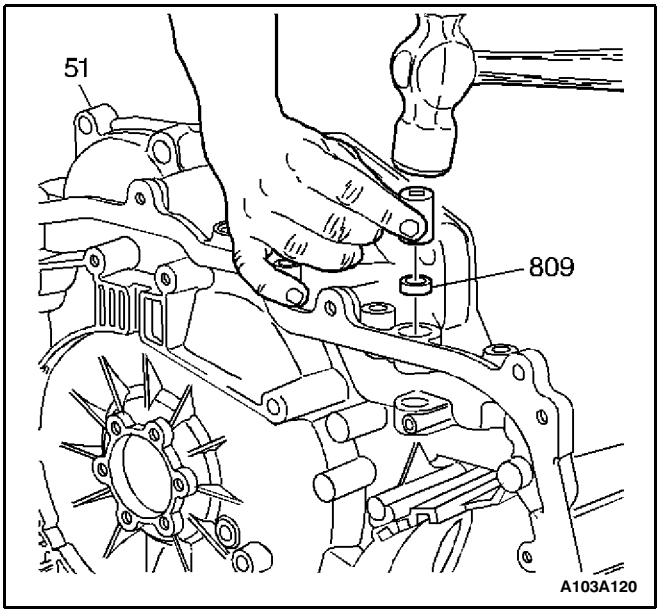


TRANSAXLE COOLER LINE SEALS INSTALLATION

Tools Required

J 41239-1 Cooler Line Seal Installer

1. **Place a new cooler line seal (49) in the case bore.**
2. **Install the J 41239-1 on the transmission case (51) at the cooler line bracket bolt hole.**
3. **Press the new cooler line seal (49) in by tightening the seal pressing bolt on the J 41239-1 until the seal bottoms out in the case bore.**
4. **Repeat steps 1-3 for the second cooler line seal (49).**

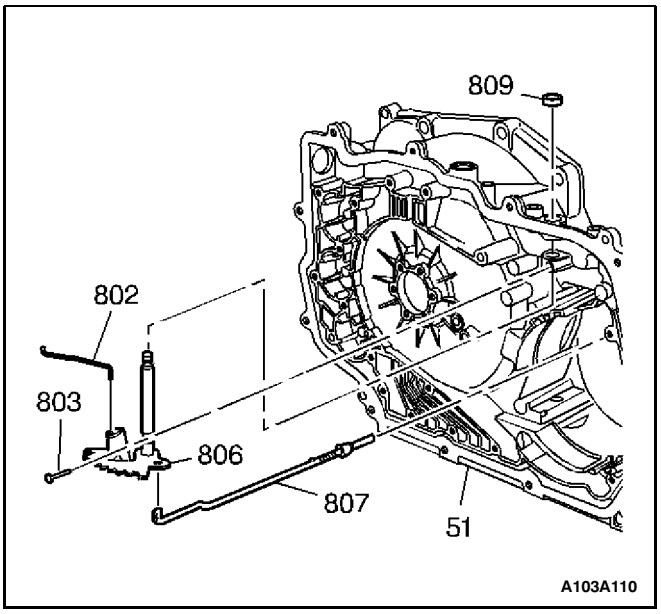


MANUAL SHAFT, DETENT LEVER, PARK LOCK INSTALLATION

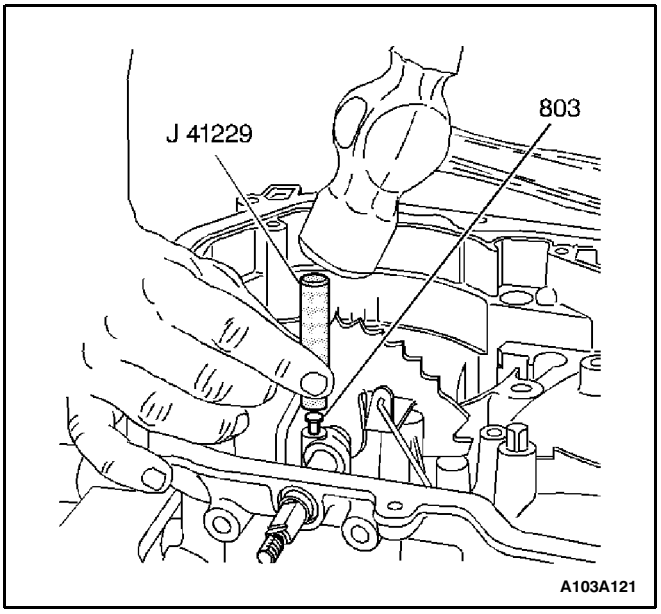
Tools Required

J 41229 Manual Shaft to Case Pin Installer

1. **Install a new manual shaft seal (809) into the case (51). Use a 13 mm socket.**

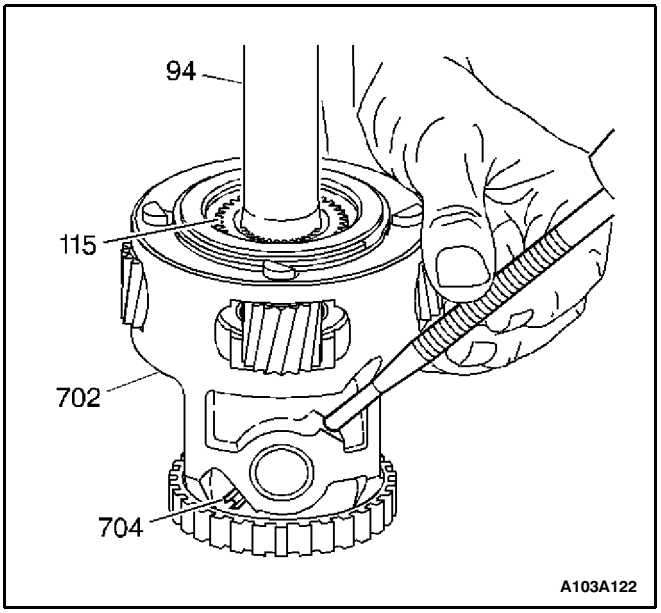


2. With the manual valve to detent lever link (802) and the parking lock actuator assembly (807) attached, install the manual shaft and detent lever assembly (806) into the case.
3. Ensure that the parking lock actuator rod is correctly positioned into the actuator guide.



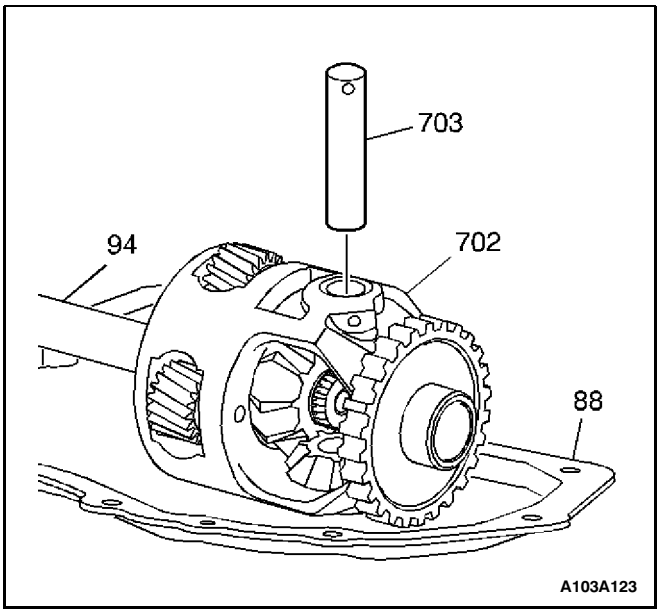
Important: Install the manual shaft pin at the correct height in order to properly secure the manual shaft. The J 41229 provides the correct installation height. If you install the pin too deep, the case boss might crack.

4. Install the manual shaft pin (803) into the case. Use the J 41229.



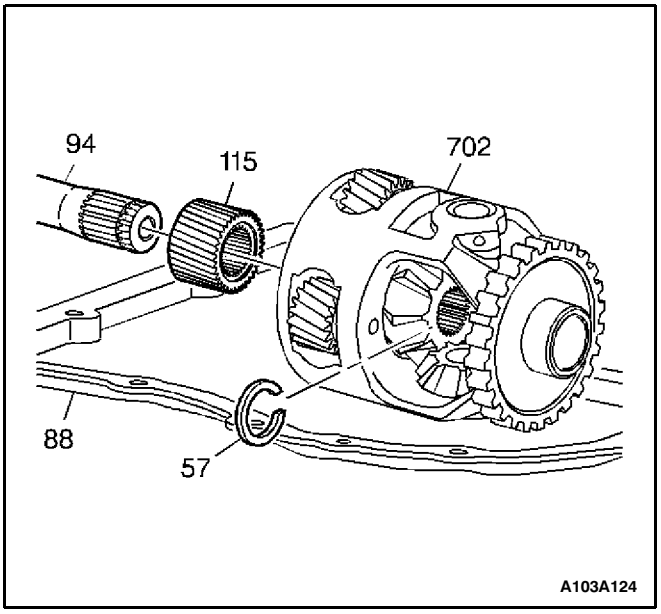
FINAL DRIVE ASSEMBLY DISASSEMBLE

1. Remove the differential pinion shaft retaining pin (704). Use a pin punch.



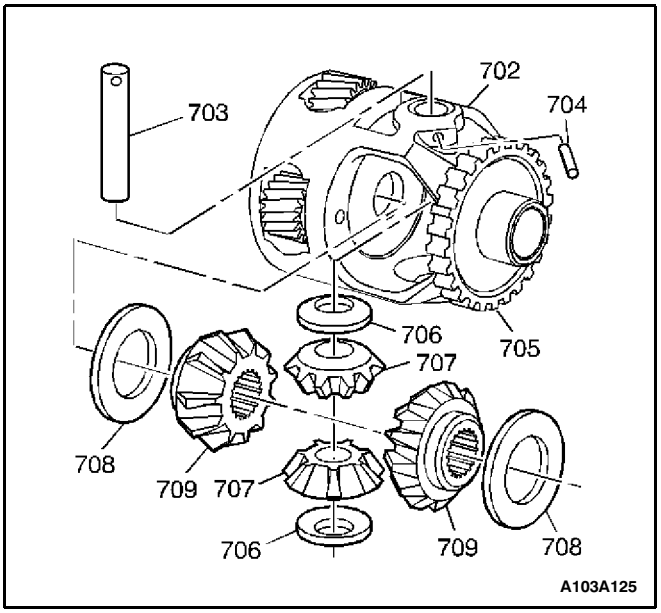
Important: If the pinion gears are removed, place the final drive carrier into a clean transmission oil pan in order to prevent losing the needle bearings.

2. **Remove the differential pinion shaft (703).**

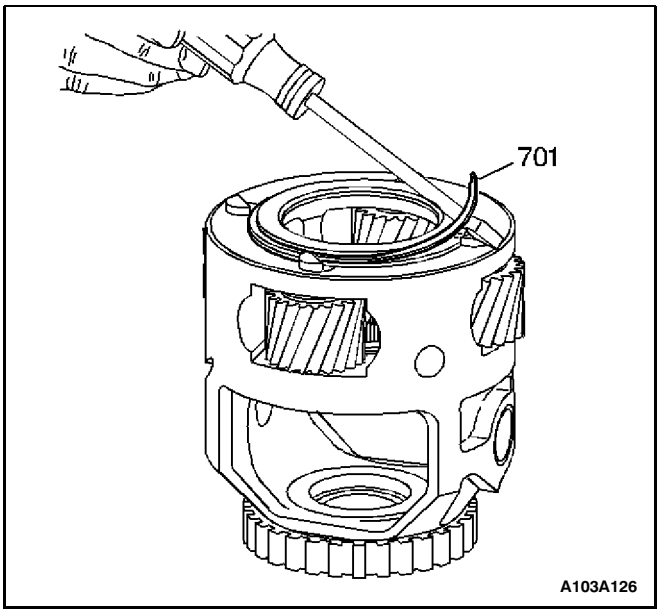


Important: The snap ring (57) is not reusable. Discard the snap ring (57).

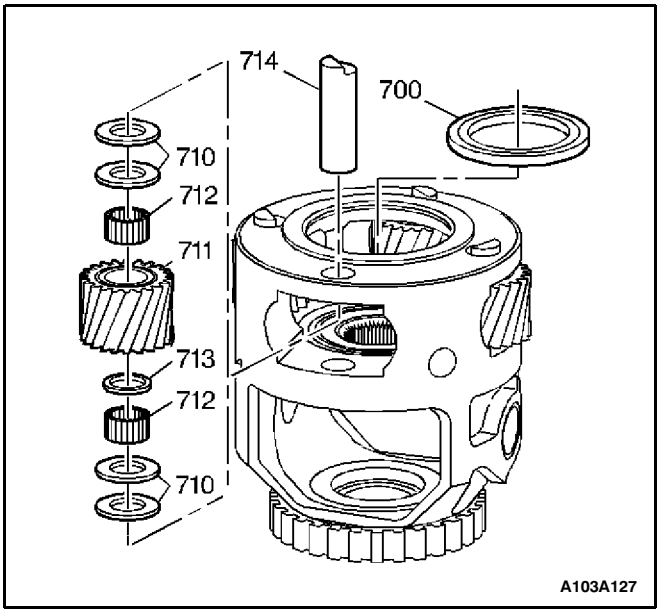
3. **Remove the snap ring (57) from the end of the output shaft (94).**
4. **Remove the output shaft (94) from the differential carrier (702).**
5. **Remove the final drive sun gear (115).**



6. **Remove the differential pinion gears (707) and the thrust washers (706).**
7. **Remove the differential side gears (709) and the thrust washers (708).**

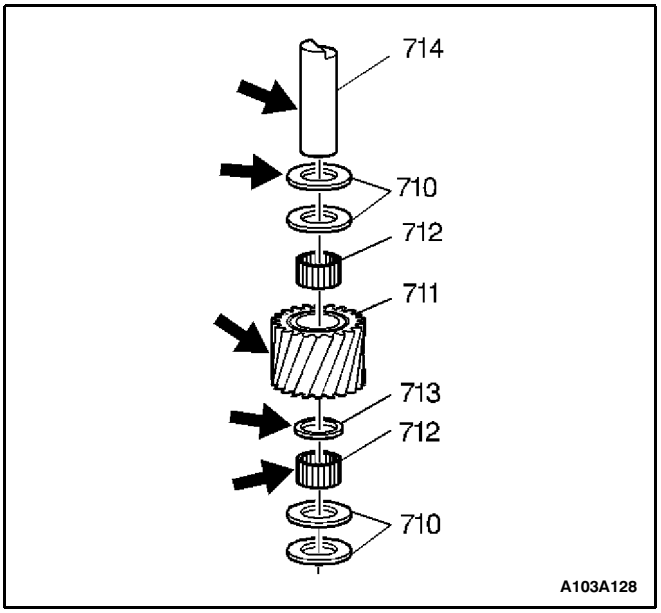


8. Remove the final drive carrier spiral retaining ring (701).

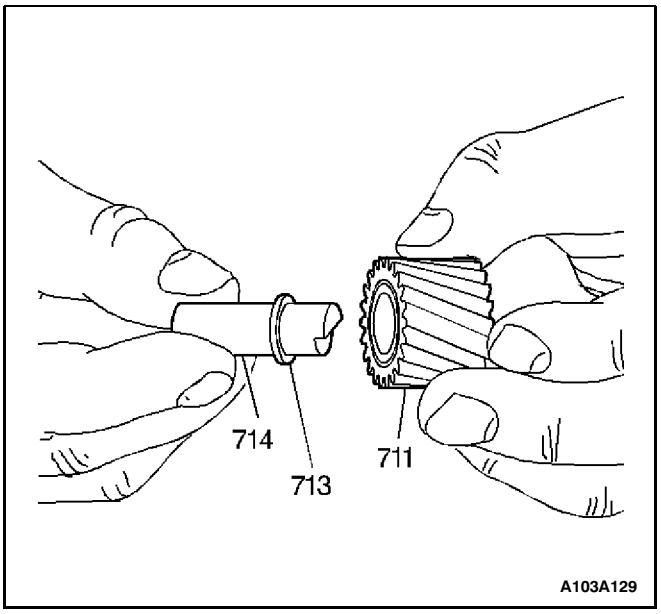


Important: When removing the pinion gears, note the orientation. You must install the pinion gears in the same direction in which you removed the pinion gears. If you install the pinion gear upside down. the change in set wear patterns will cause a noise condition.

9. Remove the four planet pinion pins (714).
10. Remove the four pinion gears (711).
11. Remove the pinion thrust washers (710).
12. Remove the needle roller bearings (712).
13. Remove the needle bearing spacers (713).
14. Remove the final drive sun gear to carrier thrust bearing (700).



15. Inspect the needle roller bearings (712), the pinion thrust washers (710), the pinion gears (711), and the planet pinion pins (714) for excessive wear. Polishing is a normal condition for the pinion pins and the needle bearings.
16. Inspect the pinion shaft (714) for spalling or for wear.
17. Inspect the pinion thrust washers (710) for wear and for cracks.
18. Clean and dry the final drive carrier and the final drive components.



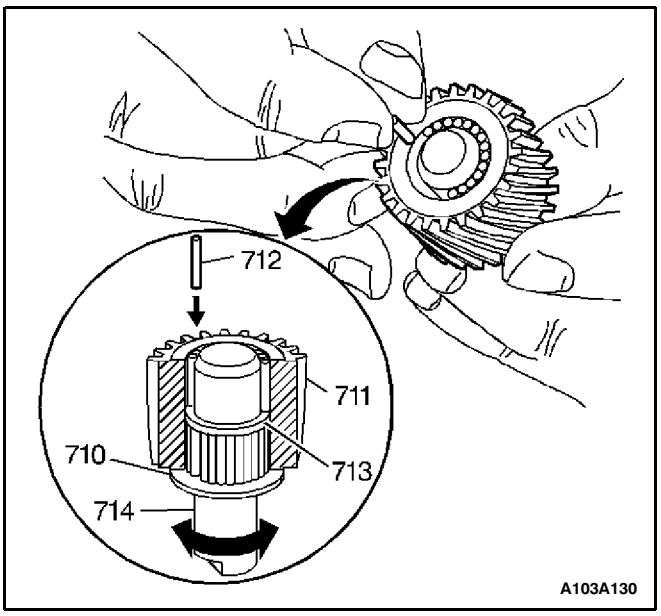
FINAL DRIVE ASSEMBLY ASSEMBLE

Tools Required

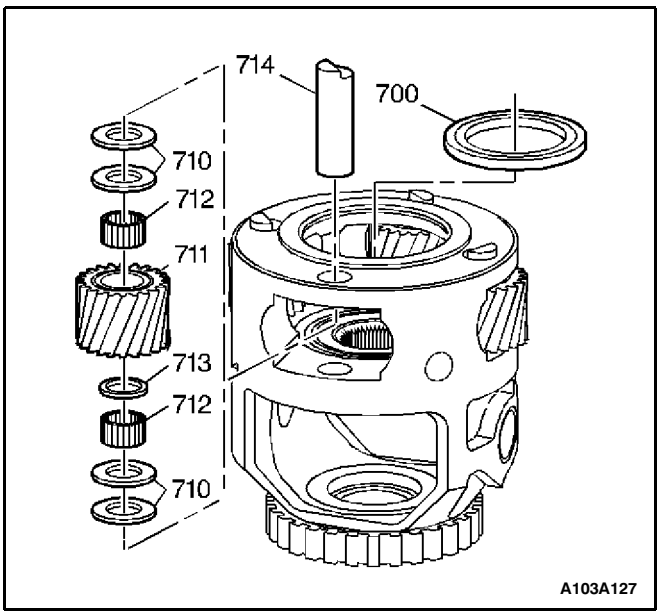
J 36850 Transjel™

Important: You must assemble the spacer between the two rows of needle bearings. In order to aid in the assembly of the needle bearings, place the spacer and the pinion gear onto the planet pinion gear pin (714).

1. **Install the pinion gear needle bearing spacer (713) onto the planet pinion gear (711).**



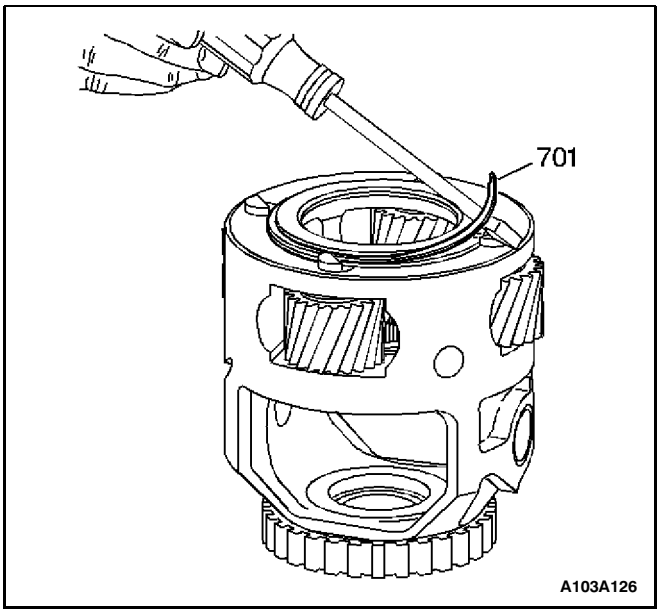
2. **Place a thrust washer (710) on the bottom of the planet pinion (711) in order to retain the bottom row of needle bearings.**
3. **Use J 36850 or equivalent in order to aid in the assembly and in order to keep the needle roller bearings (712) in the race.**
4. **Install the needle roller bearings (712) one at a time into the planet pinion (711).**



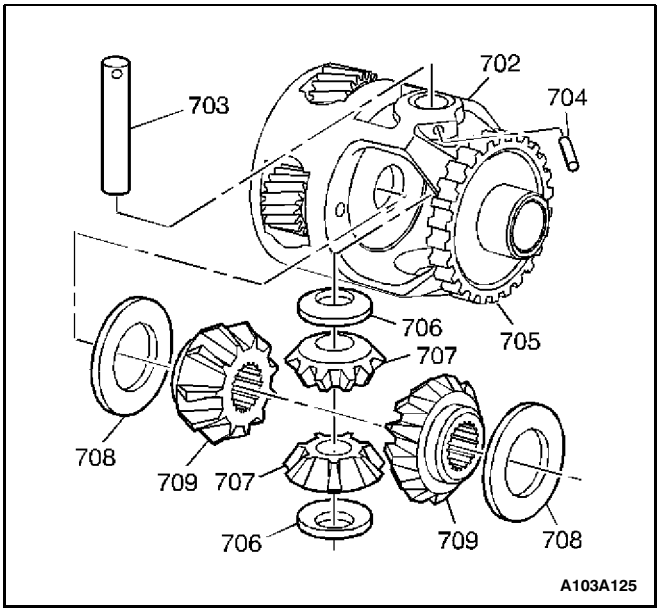
5. **Install the sun gear to final drive carrier thrust bearing (700) onto the final drive carrier (116). Retain the thrust bearing with J 36850 or equivalent.**

Important: Assemble the pinion gears (711) in the same direction that you removed the pinion gears in order to prevent noise due to changing the gear wear pattern.

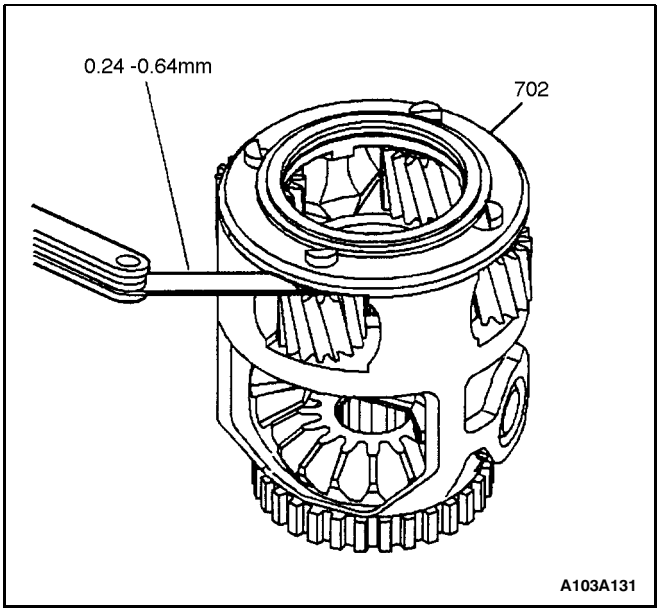
6. **Assemble the pinion gear thrust washers (710) and the planet pinion gears into the final drive carrier (116).**
7. **Install the planet pinion gear pins (714) into the final drive carrier (116) in order to retain the planet pinion gears (711).**



8. Install the final drive carrier spiral retaining ring (701) in order to retain the planet pinion gear pins.

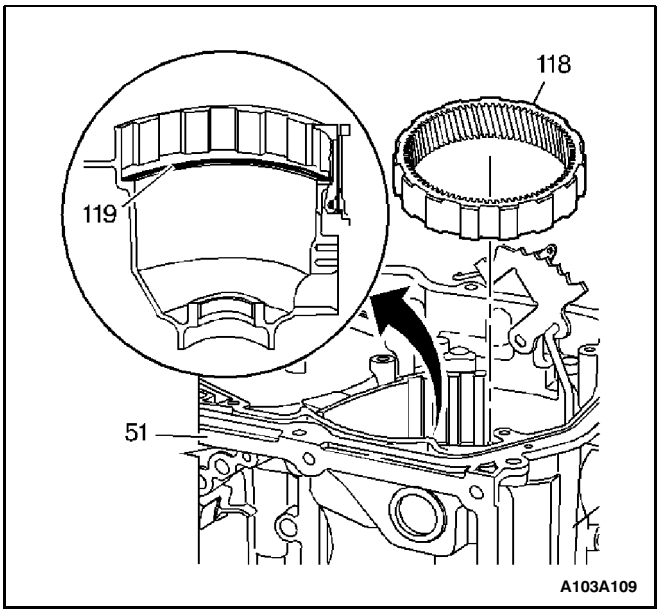


9. Assemble the thrust washers (708) onto the differential side gears (709).
10. Install the differential side gears into the final drive carrier (116).
11. Assemble the thrust washers (706) onto the pinion gears (707). Retain the thrust washers with J 36850 or equivalent.
12. With the thrust washers (706) attached, install the pinion gears (707) into the final drive carrier (116).
13. Rotate the pinion gears (707) into position, and install the pinion shaft (703) through the final drive carrier (116) and through the pinion gears (707).
14. Position the pinion shaft (703) in order to allow installation of the retaining pin.
15. Install the retaining pin (704) through the final drive carrier (116) and through the pinion shaft (703) in order to retain the pinion shaft (703).



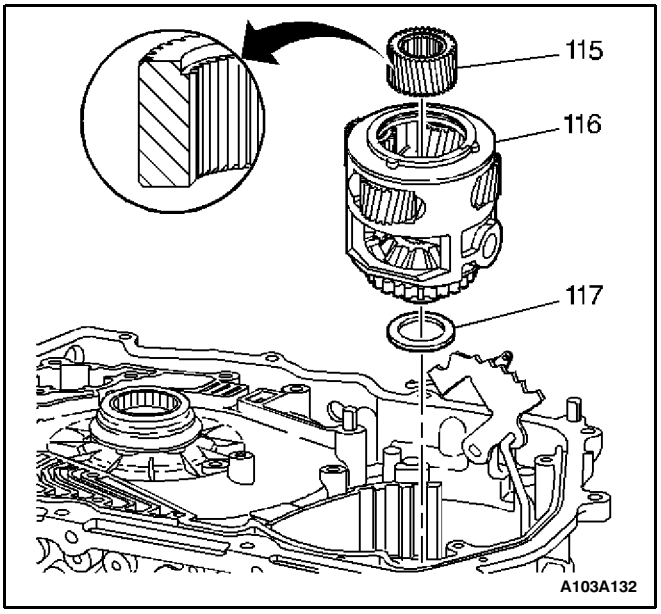
FINAL DRIVE PINION END PLAY CHECK

1. Inspect the end play with a feeler gauge for proper clearance. Proper clearance is 24-62 mm (0.009-0.024 inch).
2. If the clearance is out of specification on the low side, repair the differential assembly as necessary.
3. If the clearance is out of specification on the high side, replace the differential assembly.



FRETTING RING, FINAL DRIVE INTERNAL GEAR INSTALL

1. If the fretting ring 9119) has been removed, install the fretting ring (119) into the small groove in the transmission case (51).
2. Install the final drive internal gear (118) into the transmission case (51).



FINAL DRIVE AND DIFFERENTIAL ASSEMBLY INSTALL

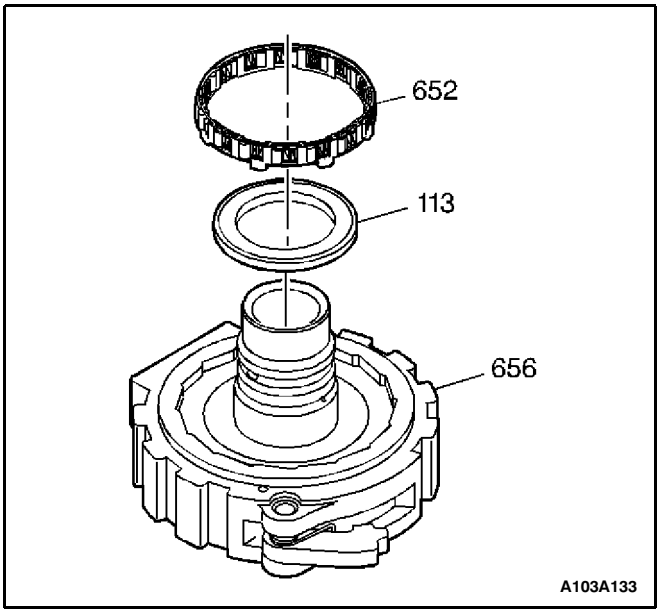
Tools Required

J 36850 Transjel™

1. Install the final drive carrier to case thrust bearing (117) onto the final drive carrier. Retain the bearing with J 36850.
2. Install the complete final drive carrier assembly (116) into the transmission case (51).

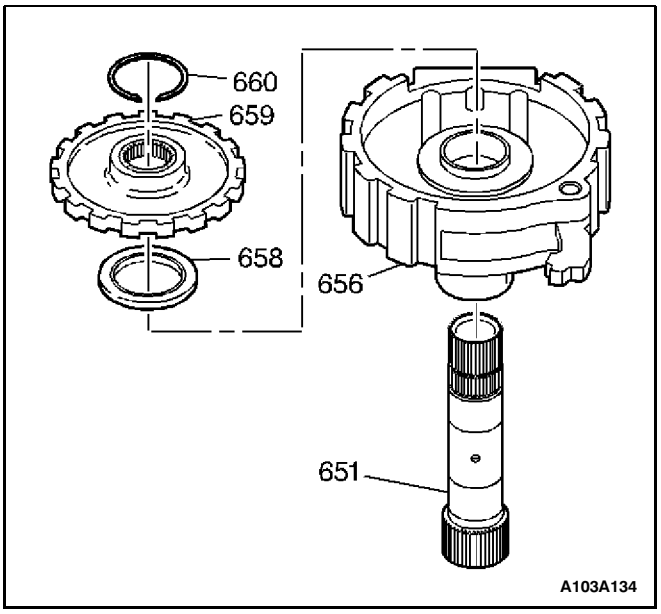
Important: Install the sun gear with the grooved side up (flat side down).

3. Install the final drive sun gear (115) into the final drive carrier (116).

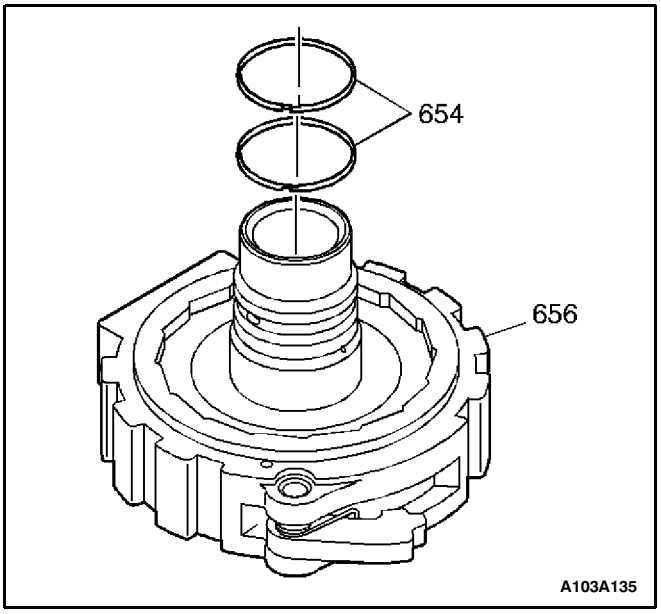


FORWARD CLUTCH SUPPORT, ROLLER CLUTCH DISASSEMBLE

1. Remove the roller clutch assembly (652) from the forward clutch support (656) by turning the roller clutch assembly (652) clockwise and gently lifting upward.
2. Remove the thrust bearing (113) from the forward clutch support (656).

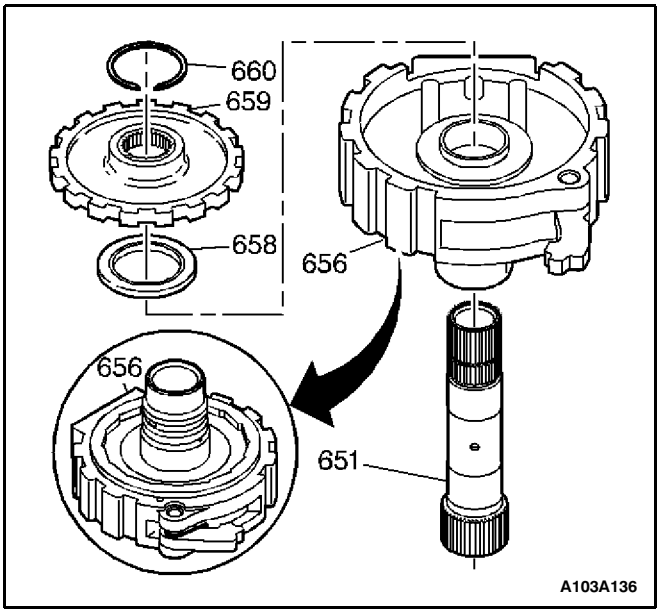


3. Remove the final drive sun gear shaft snap ring (660).
4. Remove the parking pawl gear (659).
5. Remove the forward clutch support to parking pawl gear thrust bearing (658).
6. Remove the forward clutch support (656) from the final drive sun gear shaft (651).

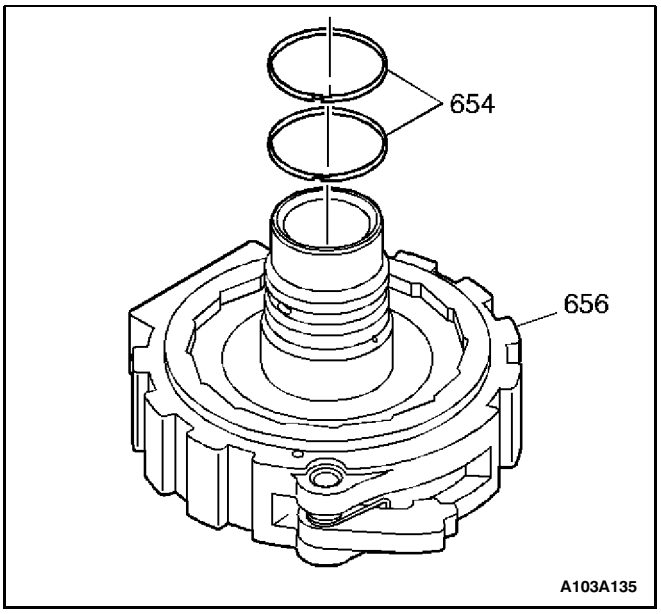


Important: The parking pawl pin has a pressed fit into the forward clutch support. The parking pawl pin is not serviceable. Do not remove the parking pawl pin.

7. Remove and discard the two seals (654) from the forward clutch support (656).

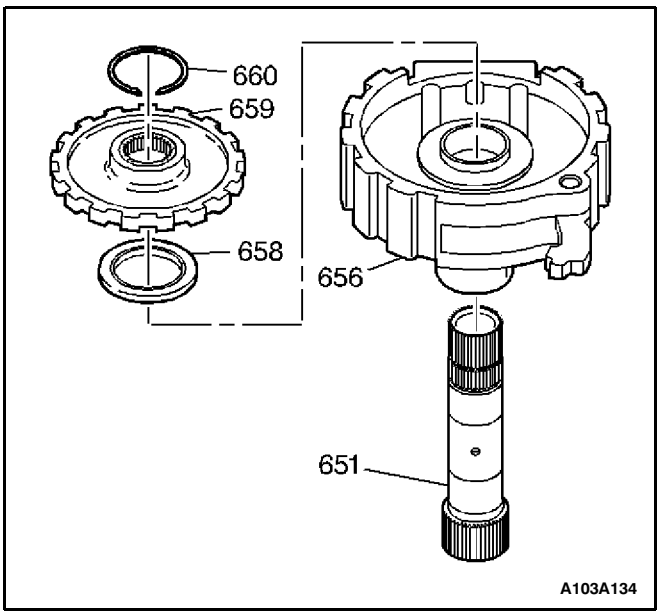


8. Inspect the snap ring for overextension (660).
9. Inspect the seal grooves for damage (656).
10. Inspect for signs of excessive bearing and bushing wear.
11. Inspect the splines and the parking gear teeth for cracks or excessive wear.
12. Inspect the fluid feed holes for the proper opening.
13. Inspect all other components for excessive wear or damage.
14. Clean and dry all of the components.



FORWARD CLUTCH SUPPORT, LOW ROLLER CLUTCH ASSEMBLE

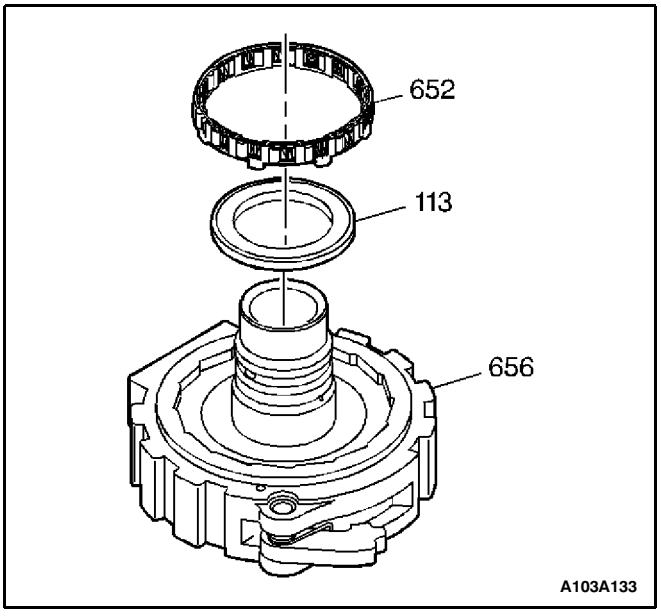
1. Assemble two new seals (654) on the forward clutch support (656).



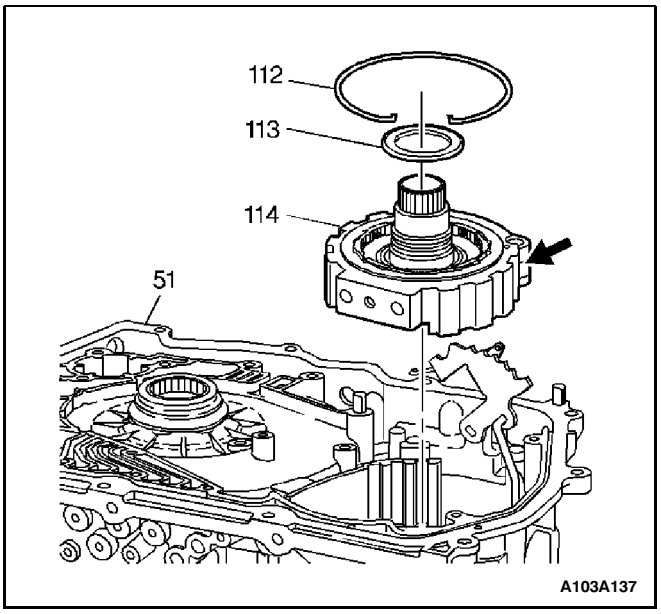
2. Assemble the forward clutch support (656) onto the final drive sun gear shaft (651).
3. Assemble the roller bearing (658) onto the forward clutch support (656).
4. Assemble the parking pawl gear (659) onto the final drive sun gear shaft (651) with the raised inner boss facing up, so that the parking pawl properly engages the teeth on the parking pawl gear.

Important: The space between the parking pawl gear (659) and the snap ring (660) is approximately 3 mm (0.12 inch).

5. Assemble the snap ring (660) to the final drive sun gear shaft (651) in order to retain the parking pawl gear (659).

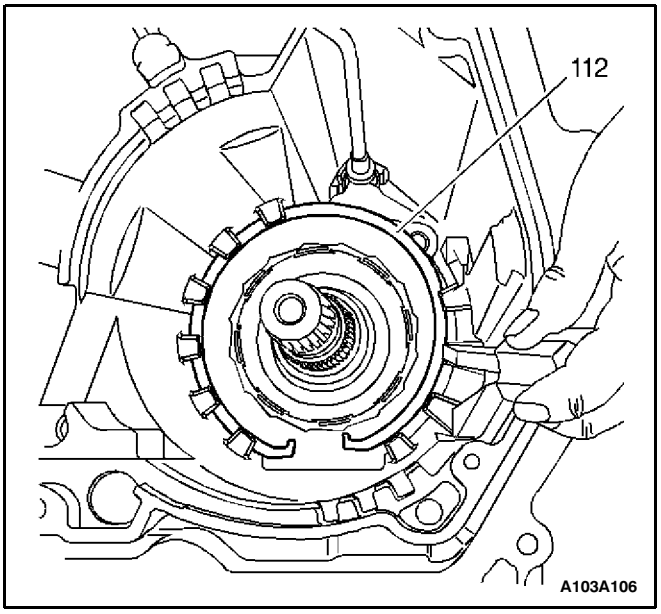


6. Assemble the lo roller clutch assembly (652) onto the forward clutch support (656). The larger tabs on the cage must face down into the forward clutch support (656). Rotate the cage slightly counterclockwise in order to lock the tabs into the grooves in the forward clutch support (656).
7. Assemble the thrust bearing (113) onto the forward clutch support (656).



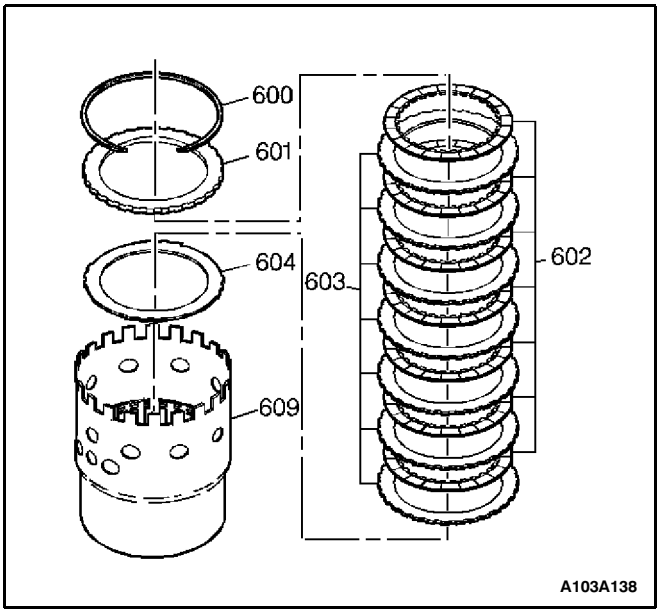
FORWARD CLUTCH SUPPORT, LOW ROLLER CLUTCH INSTALL

1. Install the forward clutch support and lo roller clutch assembly (114) into the transmission case (51). Compress the parking pawl spring, and line up the parking pawl with the parking pawl gear.



Important: When installing the forward clutch support snap ring (112), the snap ring opening must be toward the bottom of the transmission case and facing the bottom pan.

2. Install the forward clutch support snap ring (112) into the transmission case with the chamfer side up. Use a screwdriver in order to set the snap ring into place.



FORWARD CLUTCH DISASSEMBLE

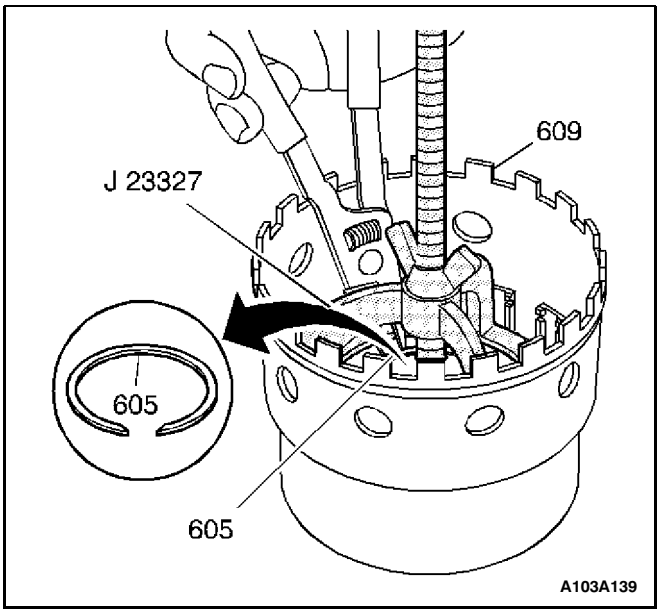
Tools Required

J 23327 Return Spring Compressor

J 41097-2 Inner Seal Remover-Disc

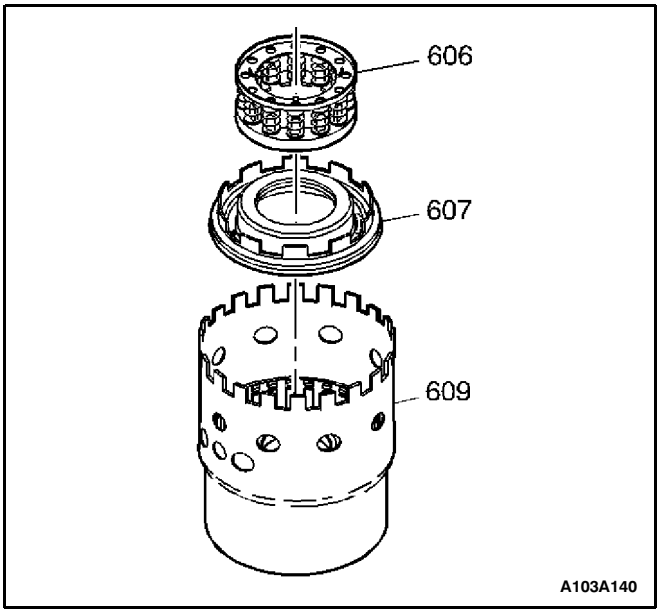
J 25031-A Puller/Inner Seal Remover

1. Remove the snap ring (600 from the housing assembly (609).
2. Remove the backing plate (601).
3. Remove the seven fiber plates (602).
4. Remove the seven steel plates (603).
5. Remove the wave plate (604).

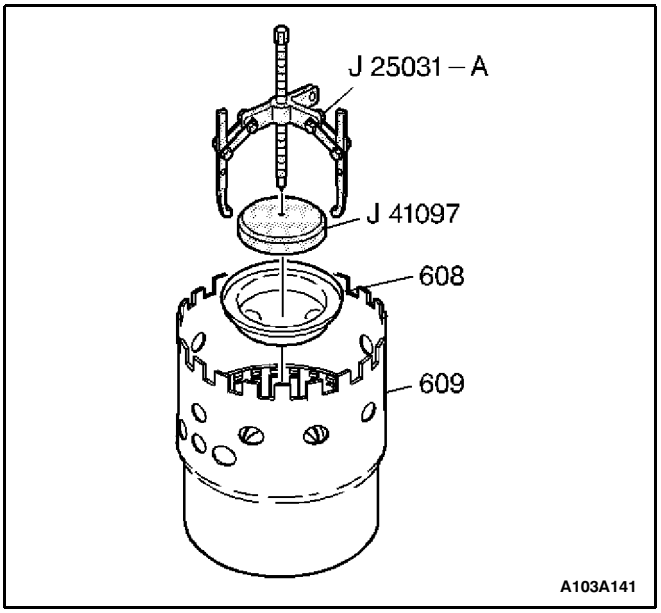


Important: In order to prevent damage to the spring assembly (606), only compress the return spring assembly (606) enough so that you can remove the snap ring (605).

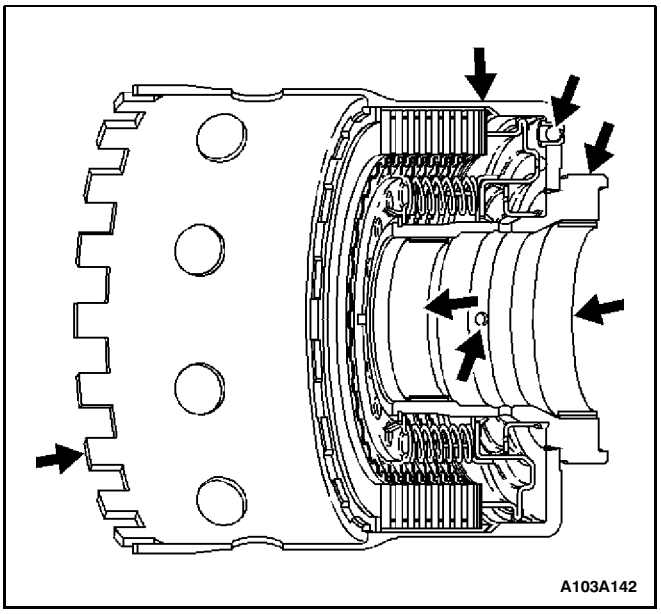
6. **Compress the forward clutch return spring assembly. Use the J 23327.**
7. **Remove the return spring snap ring (605).**
8. **Remove the J 23327.**



9. **Remove the forward clutch return spring assembly (606).**
10. **Remove the forward clutch piston and seal assembly (607).**



11. **Inspect the forward clutch inner seal assembly (608) for damage.**
12. **If the seal is damaged, place the J 41097-2 on the inner hub of the clutch housing.**
13. **Remove the seal. Use the J 25031-A.**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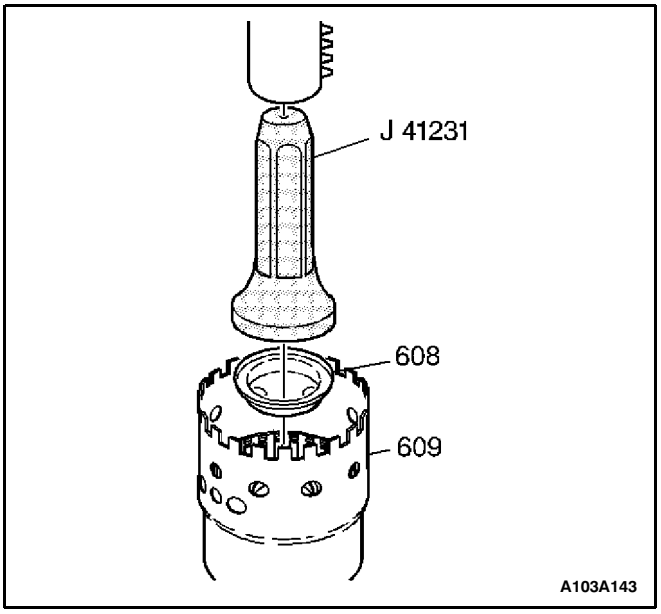
14. Inspect the housing, the plates, the bushings, the splines, the band apply surface, the roller clutch race, and the spring assembly.
15. Inspect fluid feed holes for proper openings.
16. Inspect the retainer and ball assembly for proper openings.
17. Inspect the piston and seal assembly for cut seals or other damage. The piston and seal assemblies are reusable, if not damaged.
18. Clean and dry all of the components.



A103A143

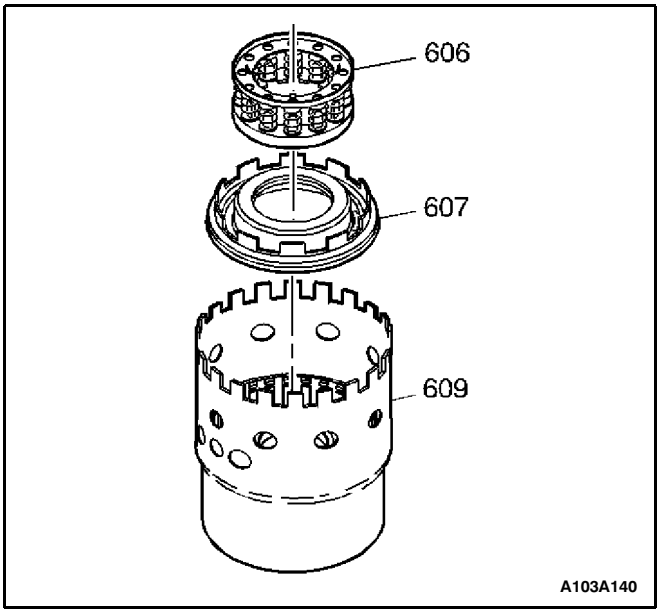
FORWARD CLUTCH ASSEMBLE

Tools Required

J 41231 Inner Seal Installer

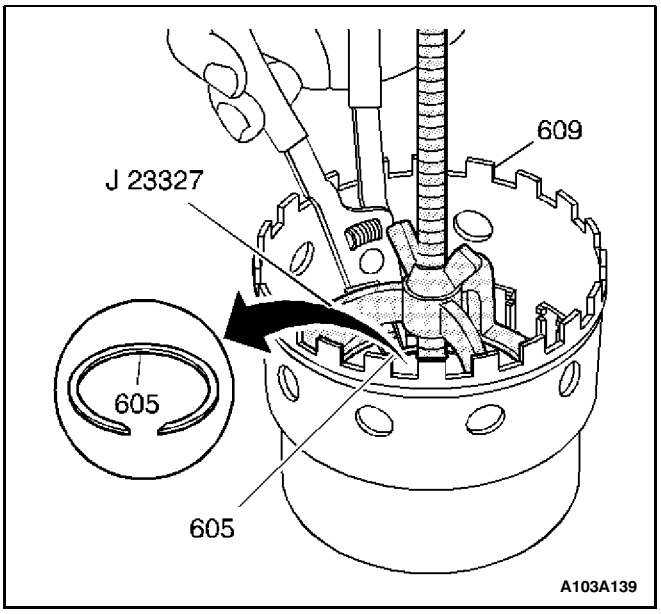
J 23327 Return Spring Compressor

1. Assemble a new inner seal assembly (608) if the old seal was damaged and removed. Use an arbor press and the J 41231 in order to press the inner seal assembly onto the forward clutch housing (609).



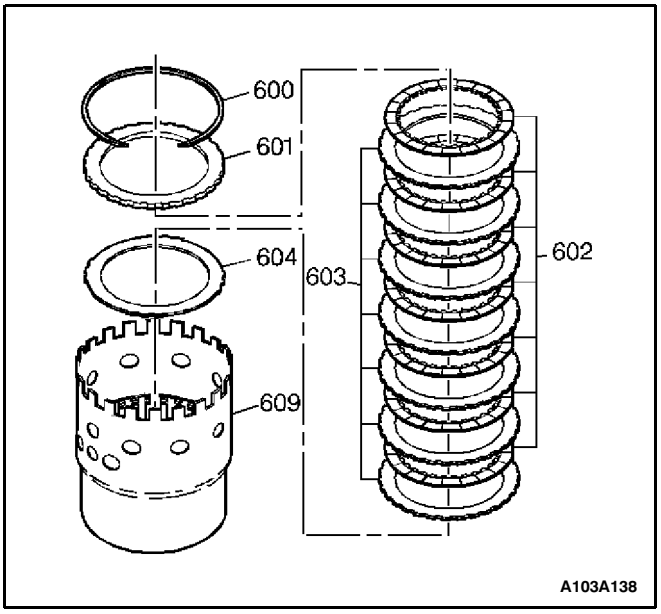
A103A140

2. Assemble the forward clutch piston assembly (607) into the forward clutch housing (609). In order to ease assembly, lubricate the seals with transmission fluid.
3. With the snap ring tabs facing up, assemble the forward clutch return spring assembly (606) into the forward clutch housing (609).

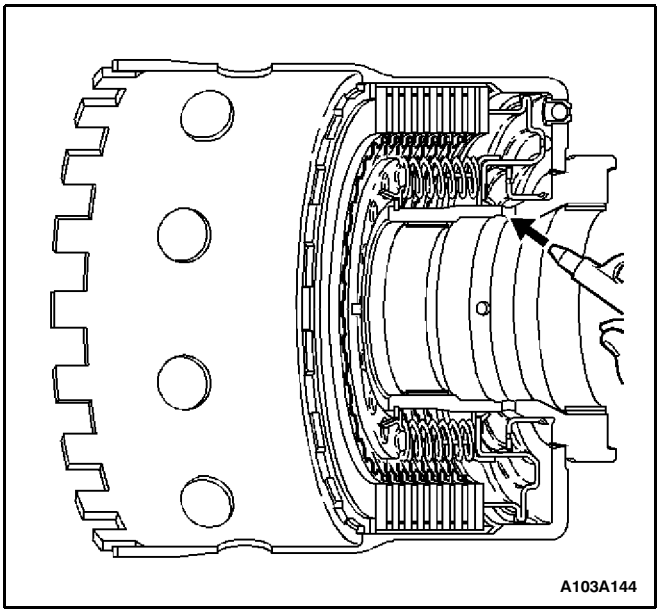


Important: In order to prevent damage to the spring assembly (606), only compress the return spring assembly (606) enough so that you can install the snap ring (605).

4. **Compress the return spring assembly. Use the J 23327.**
5. **Assemble the snap ring (605) in order to retain the forward clutch return spring.**
6. **Remove the J 23327.**

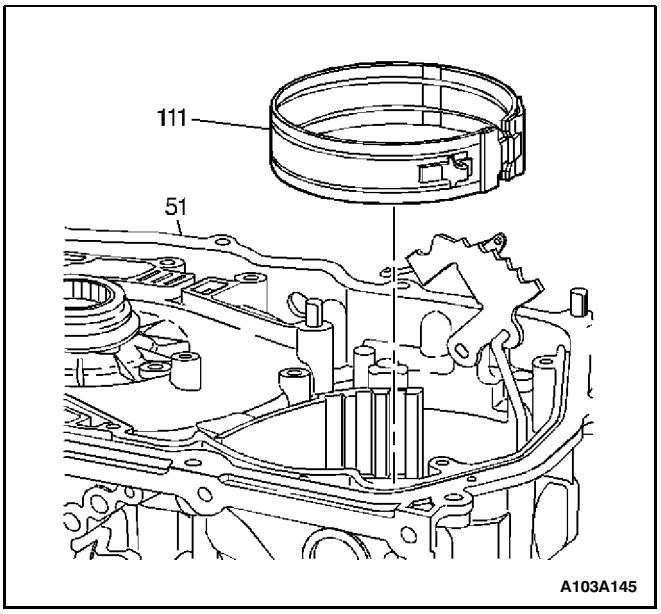


7. **Install the forward clutch waved plate (604).**
8. **Install the seven steel plates (603) and the seven new fiber plates (602) in alternating order beginning with a steel plate (603).**
9. **Install the forward clutch backing plate (601).**
10. **Install the forward clutch backing plate snap ring (600) in order to retain the clutch pack.**



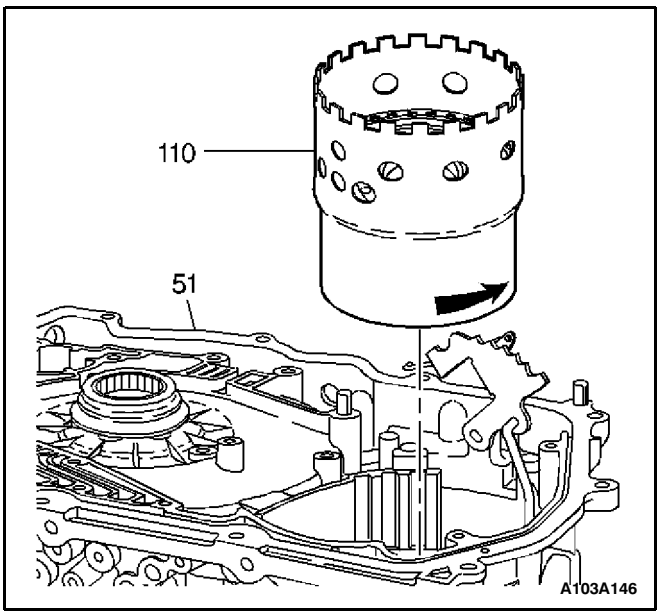
FORWARD CLUTCH FUNCTIONAL AIR CHECK

Air check the forward clutch to verify proper operation of the seals and clutch assembly.



LOW/REVERSE BAND INSTALL

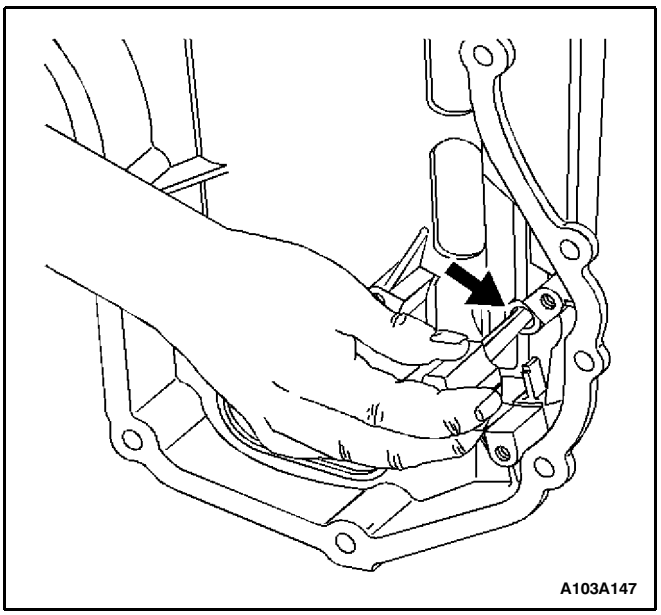
Install the low/reverse band (111) into the transmission case (51). Align the servo pin apply surface toward the bottom pan and hook the band into the band anchor pin inside the transmission case (51).



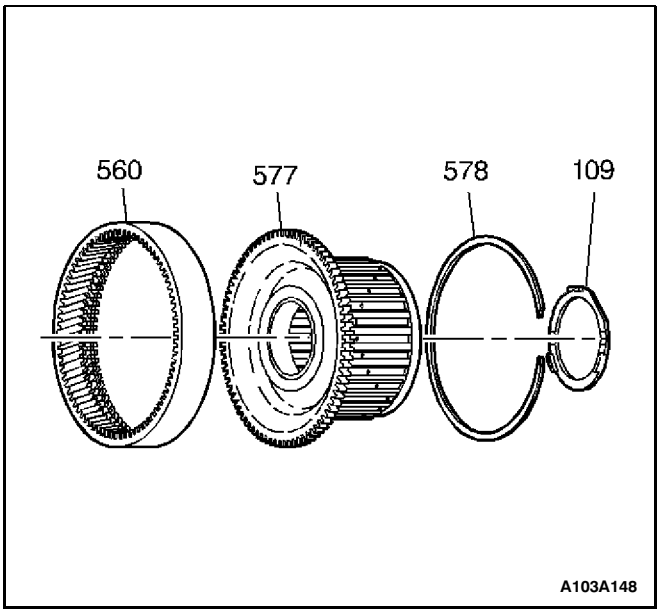
FORWARD CLUTCH INSTALLATION

Important: Rotate the forward clutch assembly (110) counterclockwise during assembly in order to seat the assembly into the lo roller clutch. When assembled correctly, the forward clutch assembly (110) should not turn clockwise.

1. **Install the forward clutch assembly (110) into the transmission case (51).**

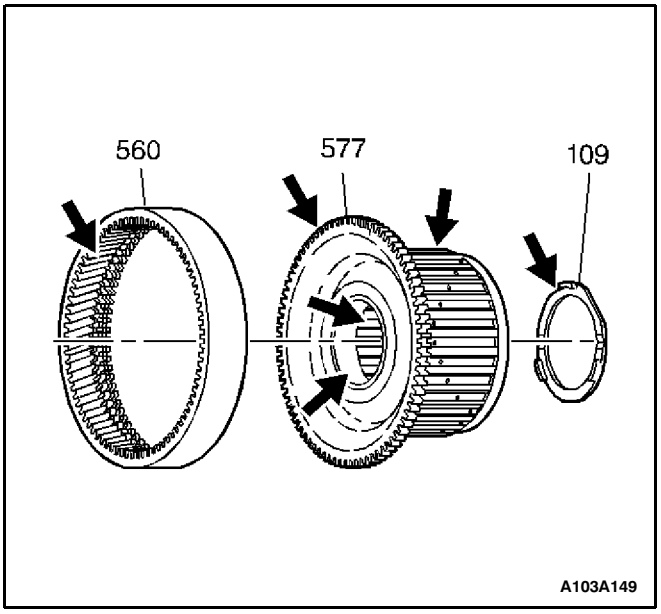


2. **Insert a screwdriver through the reverse servo pin hole in order to verify the correct installation of the lo/reverse band (111). The screwdriver should compress the band around the forward clutch housing (110).**

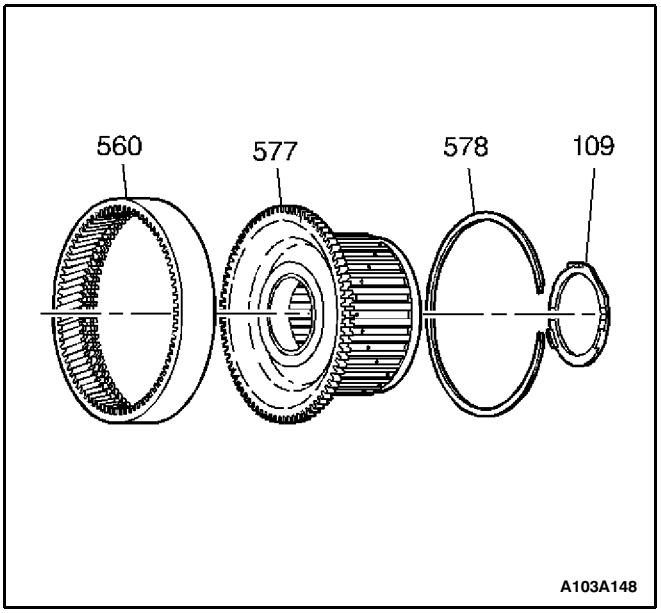


INPUT INTERNAL GEAR, FORWARD CLUTCH HUB DISASSEMBLE

1. If the thrust washer (109) has not been removed, remove the thrust washer (109) from the forward clutch hub (577).
2. Remove the input internal gear to forward clutch hub assembly snap ring (578).
3. Remove the forward clutch hub (577) from the input internal gear (560).



4. Inspect the input internal gear for damage or excessive wear.
5. Inspect the forward clutch hub splines for damage or excessive wear.
6. Inspect the busing and the thrust washer for damage or excessive wear.
7. Clean and dry all of the components.

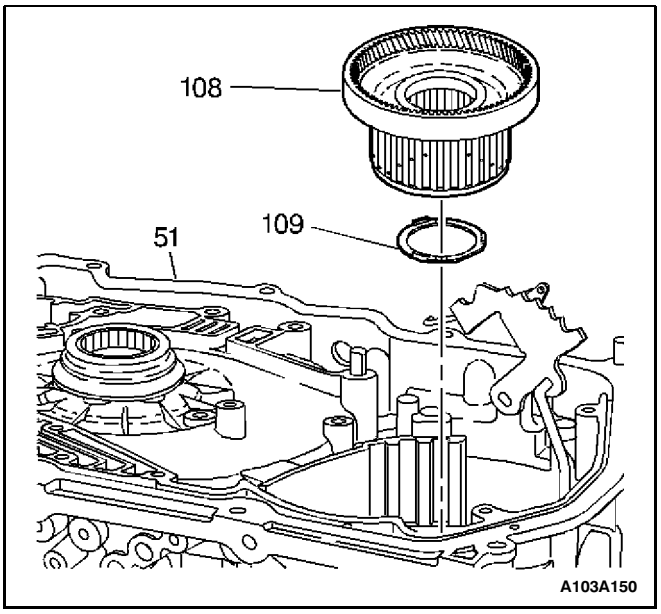


INPUT INTERNAL GEAR, FORWARD CLUTCH HUB ASSEMBLE

Tools Required

J 36850 Transjel™

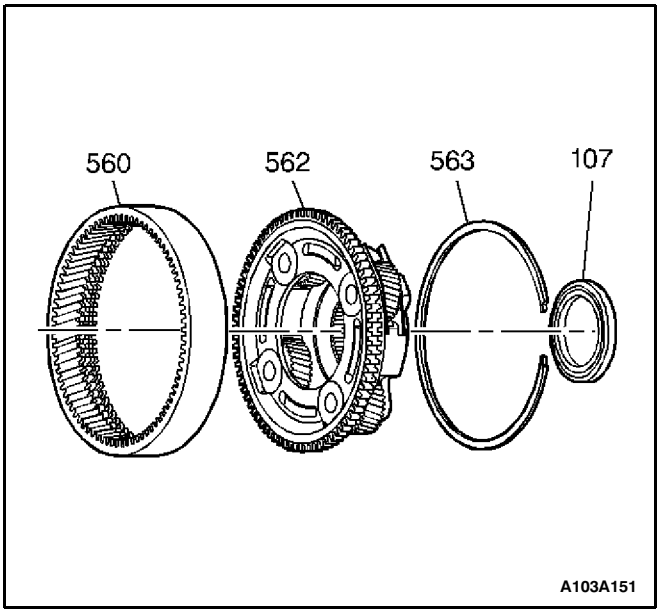
1. Assemble the forward clutch hub (577) onto the input internal gear (560) and retain it with the snap ring (578).
2. Assemble the thrust washer (109) onto the forward clutch hub (577) with the thrust washer tabs toward the forward clutch hub (577). Retain the thrust washer with J 36850 or equivalent.



INPUT INTERNAL GEAR, FORWARD CLUTCH HUB INSTALL

Important: Install the forward clutch hub and input internal gear assembly into the transmission case (51). Rotate the assembly while installing in order to spline the forward clutch hub (108) to the forward clutch plates (602).

Install the forward clutch hub and input internal gear assembly into the transmission case (51).

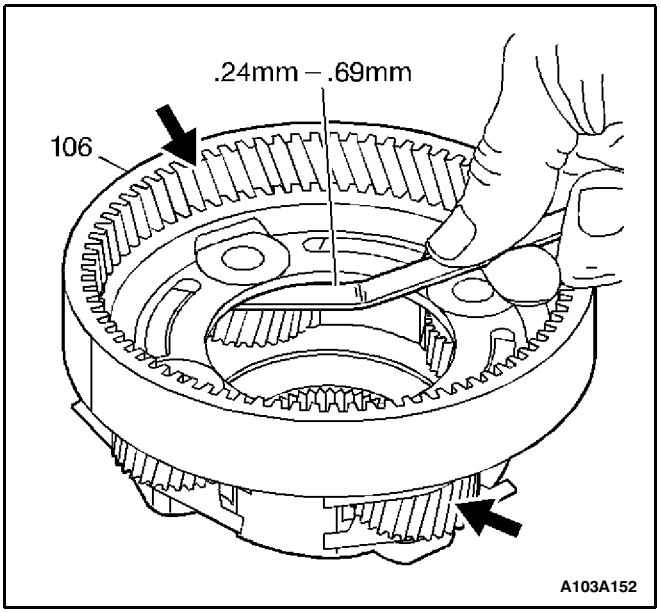


REACTION INTERNAL GEAR, INPUT CARRIER DISASSEMBLE

1. **Remove the thrust bearing (107) from the reaction carrier (562) if the thrust bearing has not been removed.**
2. **Remove the reaction internal gear (560) to input carrier assembly snap ring (563).**

Important: The reaction internal gear and the input internal gear are identical parts. However, these parts are not interchangeable after the transmission has operated in a vehicle.

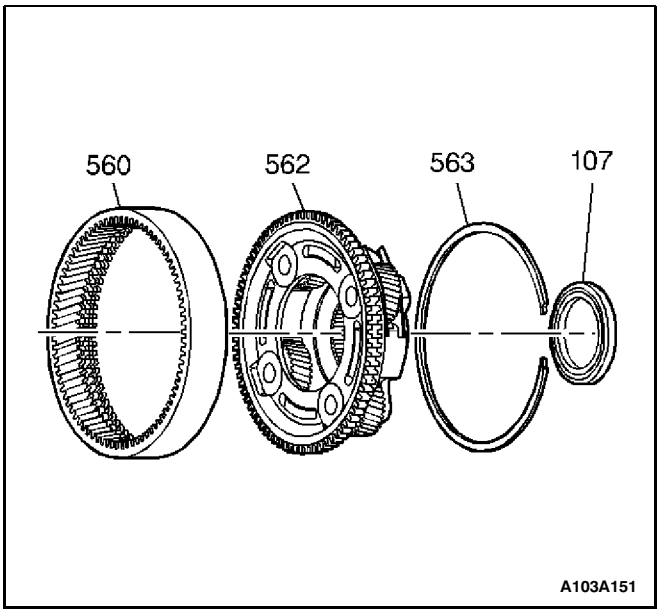
3. **Remove the input carrier assembly (562) from the reaction internal gear (560).**



INPUT CARRIER PINION GEAR CLEARANCE CHECK

Important: Replace the carrier if pinion gear clearance is out of specification. The pinion gears are permanently assembled to the carrier and are not serviced individually.

1. **Measure the pinion gear end play for proper clearance. Use a feeler gage. The clearance should be 0.24-0.69 mm (0.01-0.027 inch).**
2. **Inspect the reaction internal gear and the input carrier assembly for damage or excessive wear. Specifically inspect the condition of the pinion gears, the washers, and the thrust bearings.**
3. **Clean and dry each of the components.**

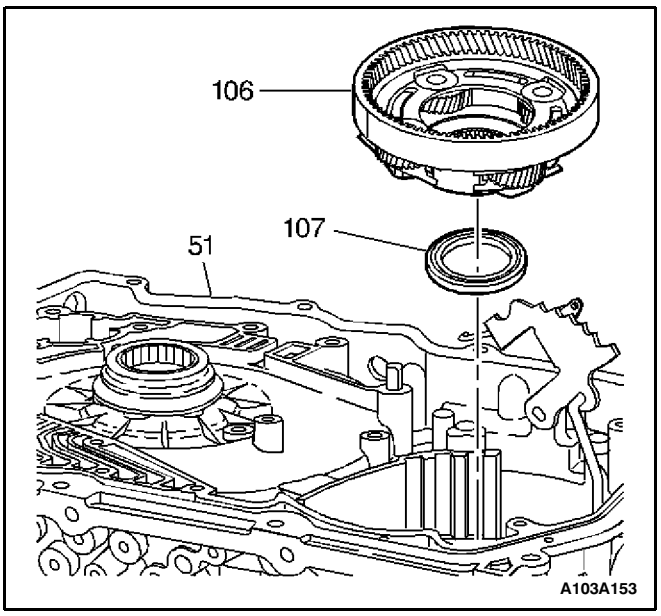


REACTION INTERNAL GEAR, INPUT CARRIER ASSEMBLE

Tools Required

J 36850 Transjel™

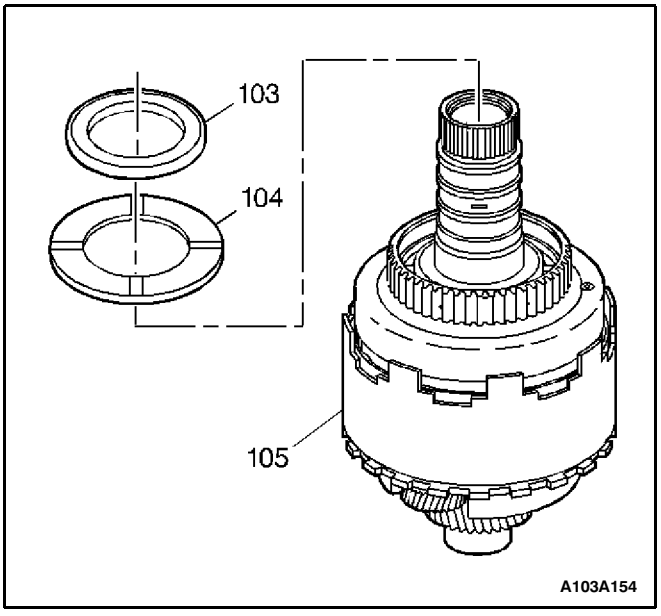
1. **Assemble the input carrier assembly (562) to the reaction internal gear (560).**
2. **Retain the input carrier assembly with the snap ring (563).**
3. **Assemble the thrust bearing (107) onto the input carrier assembly.**
4. **Retain the thrust bearing with J 36850 or equivalent. You will find another thrust bearing permanently retained in the input carrier assembly (562).**



REACTION INTERNAL GEAR, INPUT CARRIER INSTALL

Important: While installing the reaction internal gear and input carrier assembly, rotate the assembly in order to mesh the input carrier pinion gears to the input internal gear.

Install the reaction internal gear and input carrier assembly (106) into the transmission case (51).



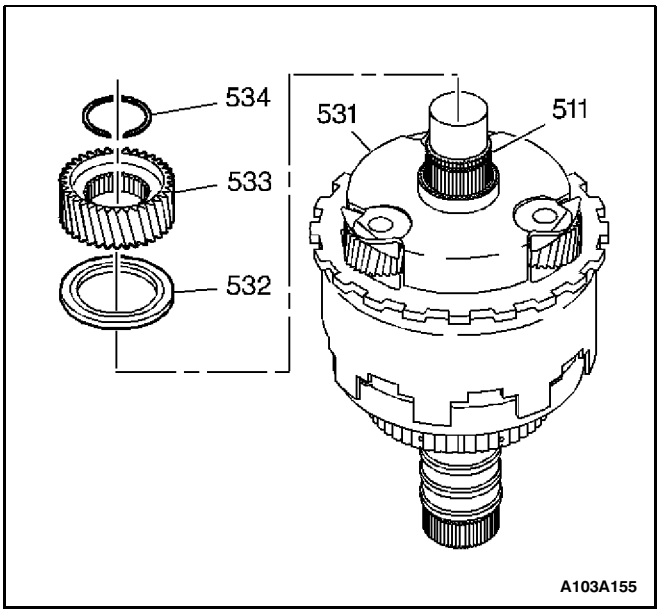
DIRECT/COAST CLUTCH, REACTION CARRIER DISASSEMBLE

Tools Required

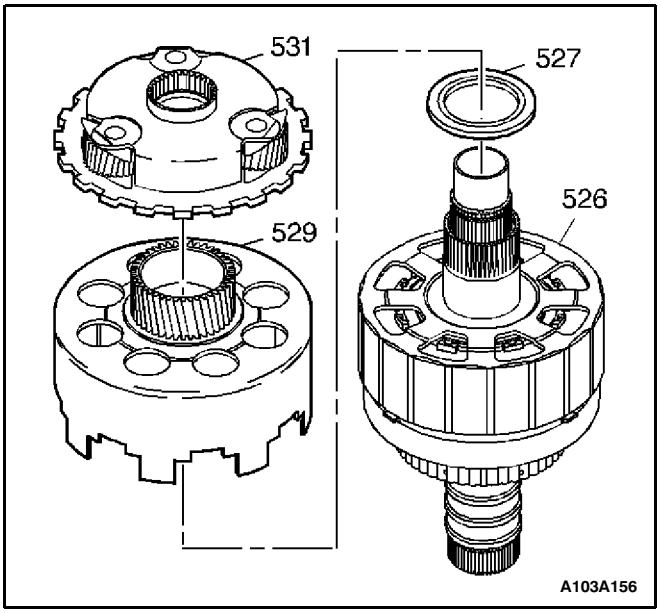
J 41232 Direct Clutch Return Spring

J 41236 Coast Clutch Return Spring Compressor

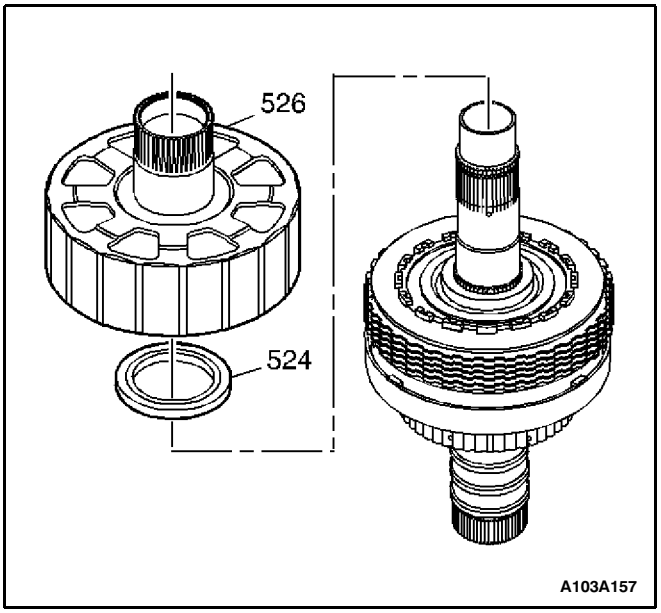
1. **Remove the selective thrust bearing (103) and the thrust washer (104) from the input shaft of the direct and coast clutch assembly (105).**



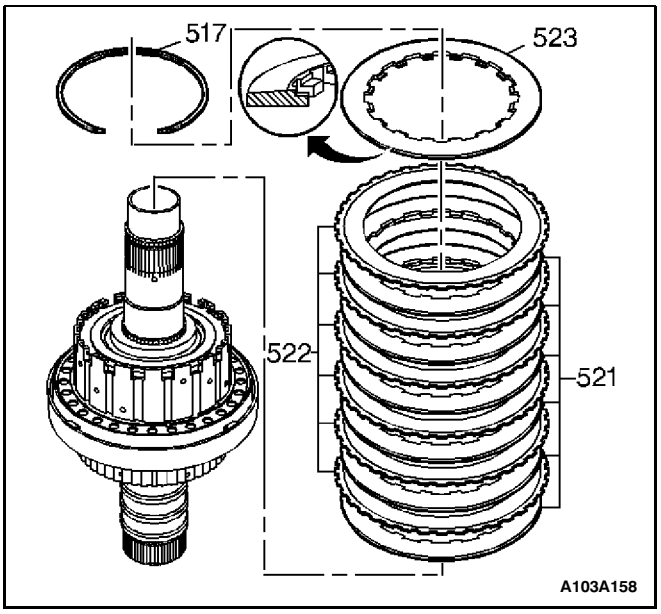
2. Remove the input sun gear to input sun gear shaft snap ring (534).
3. Remove the input sun gear (533) from the input sun gear shaft (511).
4. Remove the thrust bearing (532) from the reaction carrier assembly (531).



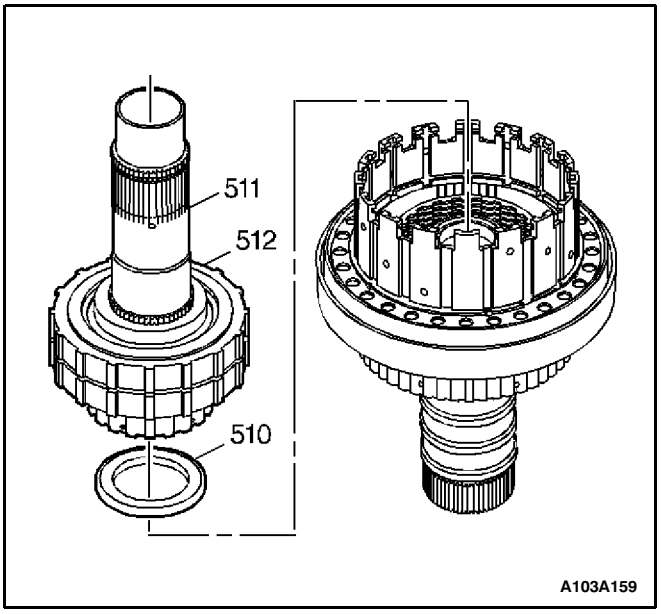
5. Remove the reaction carrier assembly (531).You will find a thrust bearing permanently installed in the reaction carrier assembly under the pinion gears.
6. Remove the reaction sun gear and shell assembly (529).
7. Remove the thrust bearing (527) from the reaction carrier shaft and shell assembly (526).



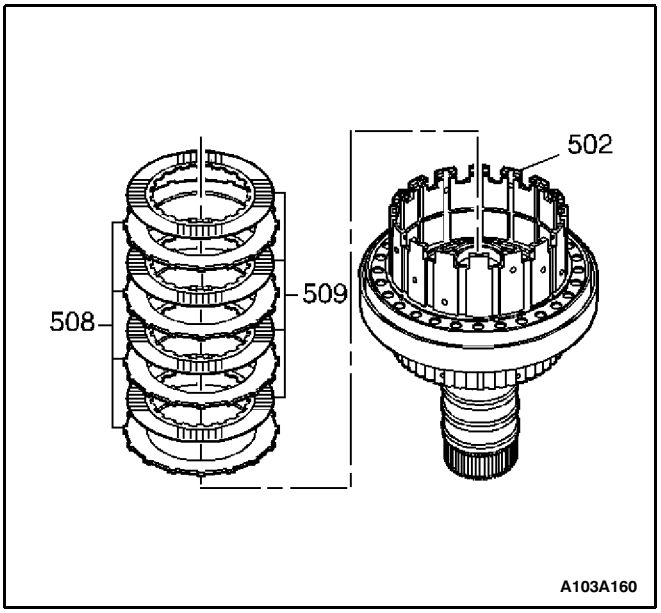
8. Remove the reaction carrier shaft and shell assembly (526).
9. Remove the thrust bearing (524) from the top of the sprag race assembly.



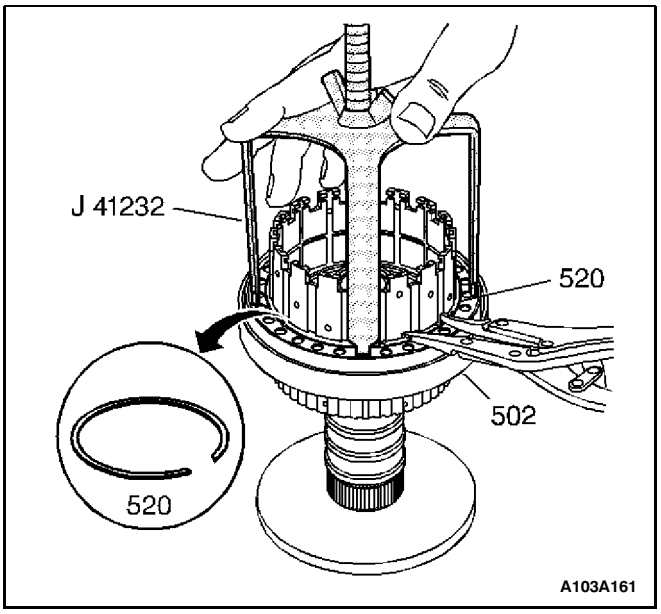
10. Remove the sprag clutch retaining snap ring (517).
11. Remove the direct clutch plates from the direct coast clutch input housing. The direct clutch consists of a backing plate (523), steel plates (521) and fiber plates (522).



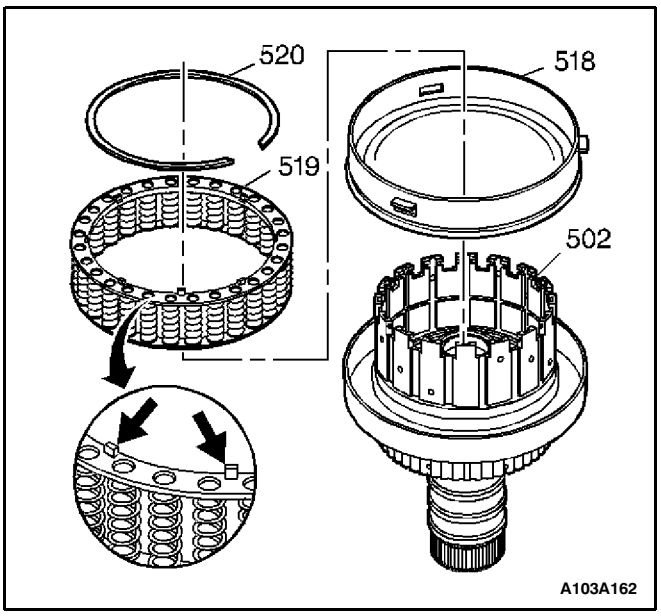
12. Lift up on the input sun shaft (511) in order to remove the input sun shaft (511) and the sprag (512) as an assembly.
13. Remove the inner race to input housing thrust bearing (510) if the inner race to input housing thrust bearing did not remain with the input sun shaft and sprag assembly.



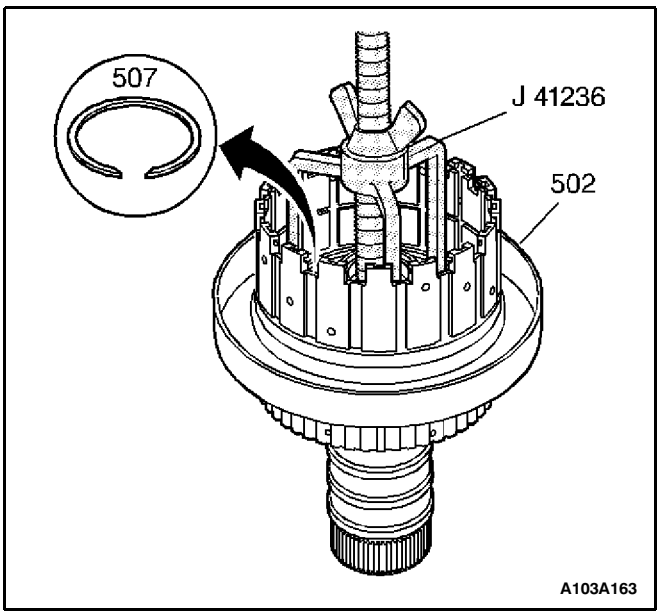
14. Remove the coast clutch plates from the input housing (502). The coast clutch consists of four steel plates (508) and four fiber plates (509).



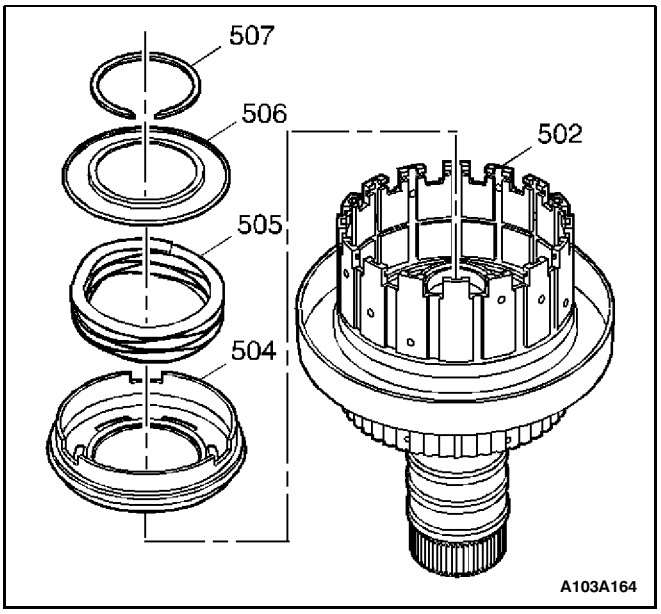
15. Compress the direct clutch return spring assembly. Use the J 41232.
16. Remove the spring retaining snap ring (520).
17. Remove the J 41232.



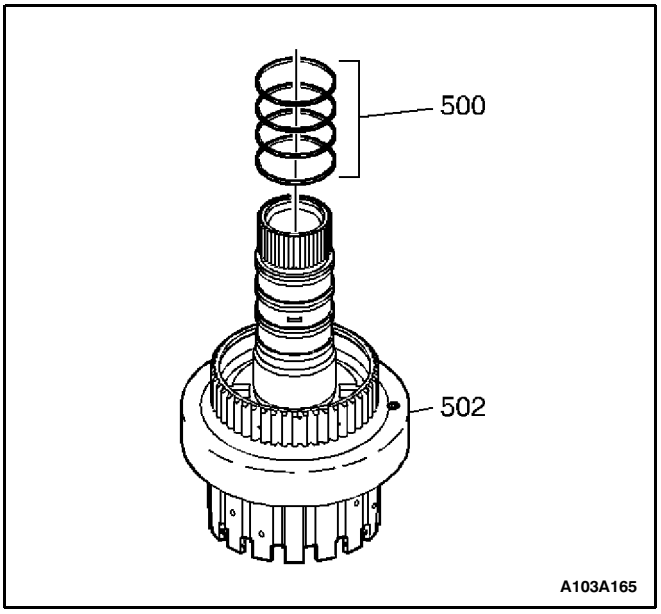
18. Remove the direct clutch return spring (519).
19. Remove the direct clutch piston and seal assembly (518).



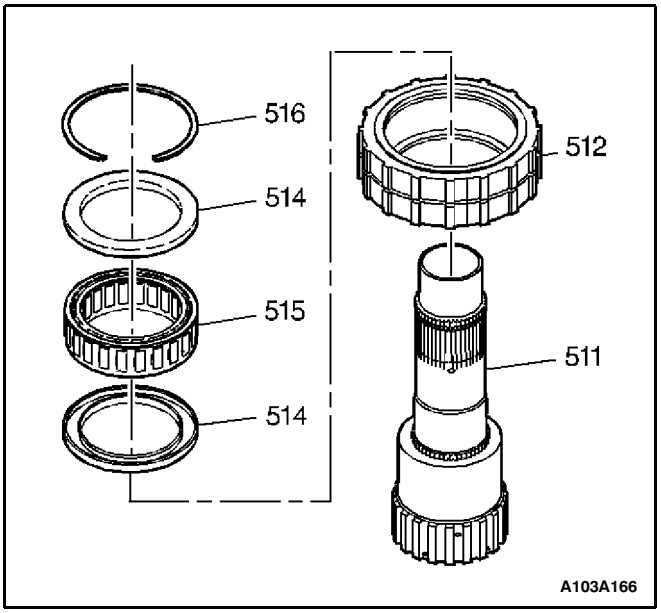
20. Compress the coast clutch return spring. Use the J 41236.
21. Remove the spring retaining snap ring (507).
22. Remove the J 41236.



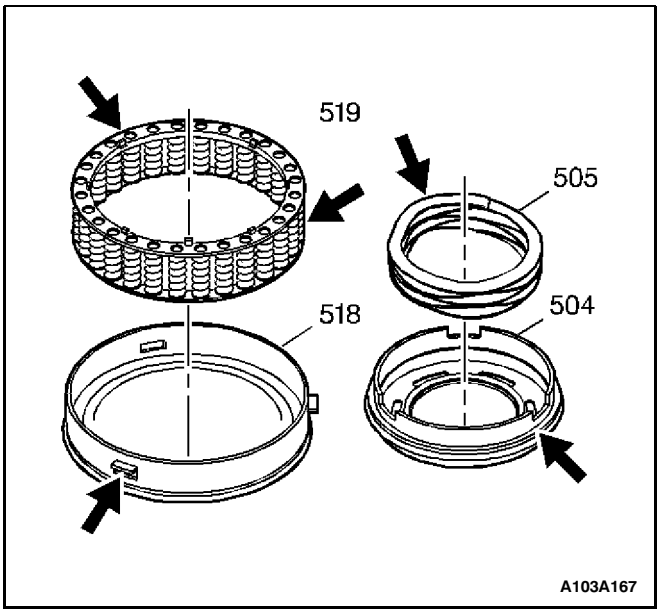
23. Remove the coast clutch return spring retainer (506) and the release spring (505).
24. Remove the coast clutch piston and seal assembly (504).



25. Remove and discard the four Teflon™ oil seals (500) from the input shaft assembly (502).

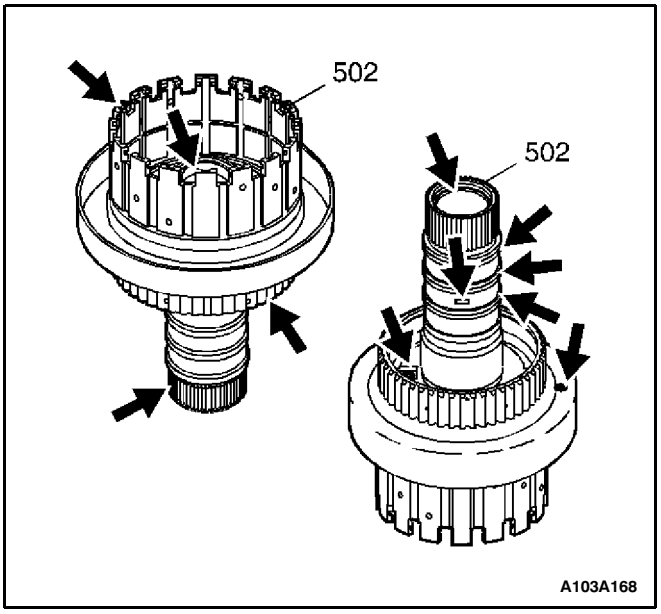


26. Remove the input sprag assembly (512-516) from the input sun gear shaft (511).
27. Remove the snap ring (516) from the sprag assembly (515).
28. Remove the sprag clutch assembly (515) from the sprag outer race (513).
29. Remove the two end bearings (514) from the sprag clutch assembly (515).

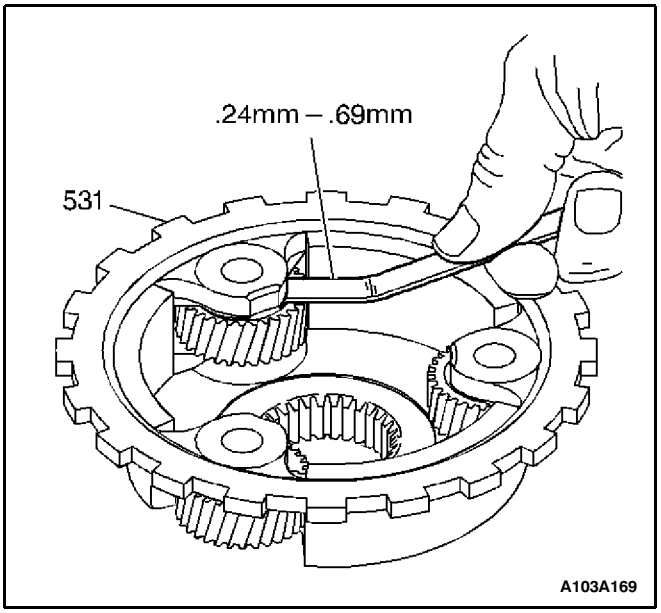


Important: The pistons are reusable if not damaged. If the pistons or seals are damaged, replace the assembly.

30. **Inspect the piston (518 and 504) and seal assemblies for damage or cut seals.**
31. **Inspect the clutch spring (519) assemblies for distortion or missing springs.**



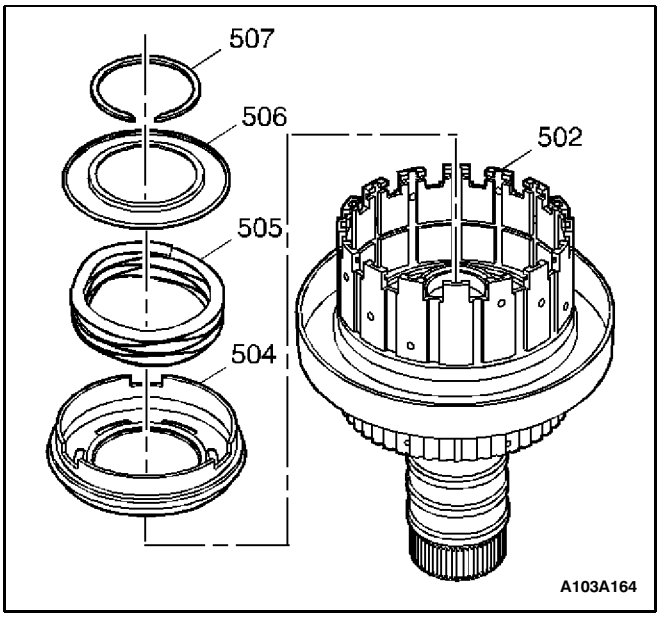
32. **Inspect the direct clutch and coast clutch retainer and ball assemblies for leaks or damage.**
33. **Inspect the oil passages for blockage.**
34. **Inspect the bushings and bearings for excessive wear.**
35. **Inspect the seal grooves on the input shaft for nicks or damage.**
36. **Inspect the splines, housings and clutch plates for cracks, excessive wear or damage.**
37. **Inspect all other components for damage or excessive wear.**



REACTION CARRIER PINION CLEARANCE CHECK

Important: Replace the carrier assembly if the pinion gear clearance is out of specification. The pinion gears are permanently assembled to the carrier and are not serviced individually.

1. **Measure the reaction carrier pinion gear end play for proper clearance. Use a feeler gauge. The clearance is 0.24-0.69 mm (0.01-0.027 inch).**
2. **Clean and dry each of the components.**



DIRECT/COAST CLUTCH, REACTION CARRIER ASSEMBLE

Tools Required

J 41236 Coast Clutch Return Spring Compressor Adapter

J 41232 Direct Clutch Return Spring Compressor Adapter

J 36850 Transjel™

J 41234-1 Input Shaft Seal Installer Pusher

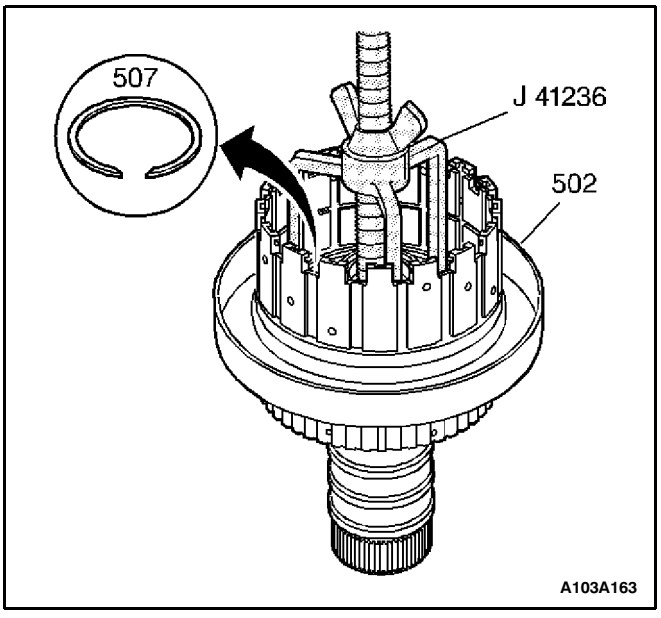
J 41234-2 Input Shaft Seal Installer Protector

J 41234-3 Input Shaft Seal Installer Sizer

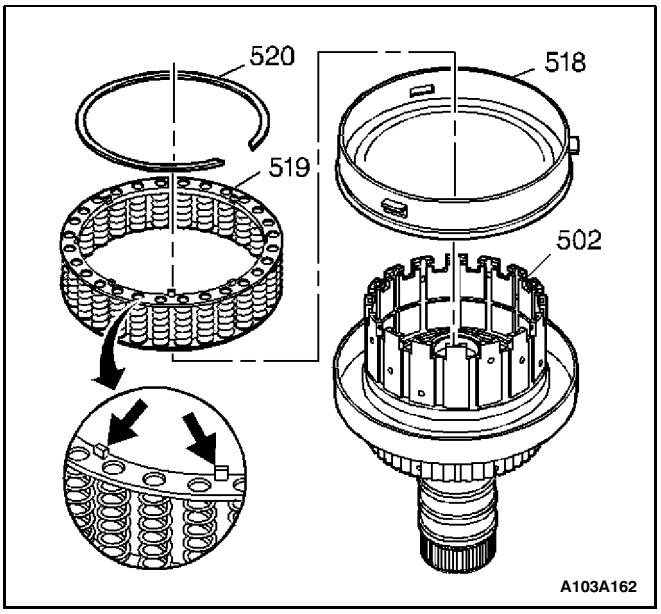
1. **In order to aid in the assembly, lubricate the seal with transmission fluid.**
2. **Assemble the coast clutch piston and seal assembly (504) into the input housing (502).**

Important: You must assemble the spring retainer with the inner lip facing up.

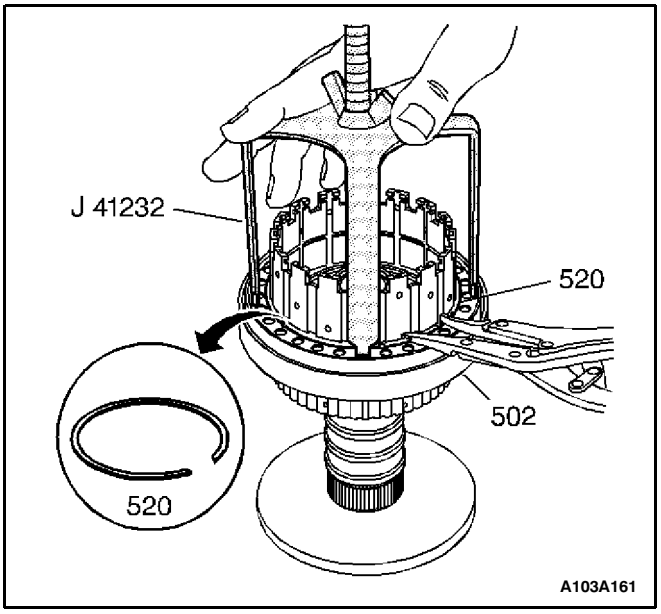
3. **Assemble the coast clutch release spring (505) and spring retainer (506) into the input housing (502).**



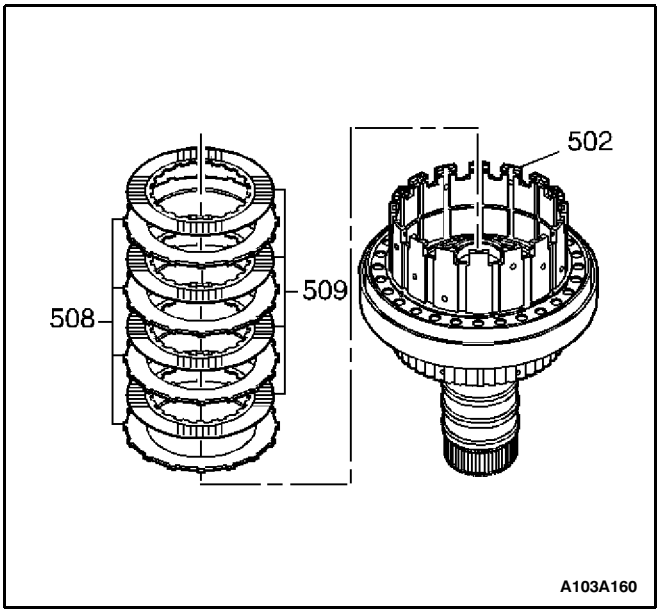
4. **Compress the coast clutch return spring retainer (506). Use the J 41236.**
5. **Assemble the coast clutch spring retainer snap ring (507) onto the input housing (502).**
6. **Remove the J 41236.**



7. In order to aid in the assembly, lubricate the seal with transmission fluid.
8. Assemble the direct clutch piston and seal assembly (518) into the input housing (502).
9. Assemble the direct clutch return spring assembly (519) into the input housing with the snap ring retaining tabs facing up.

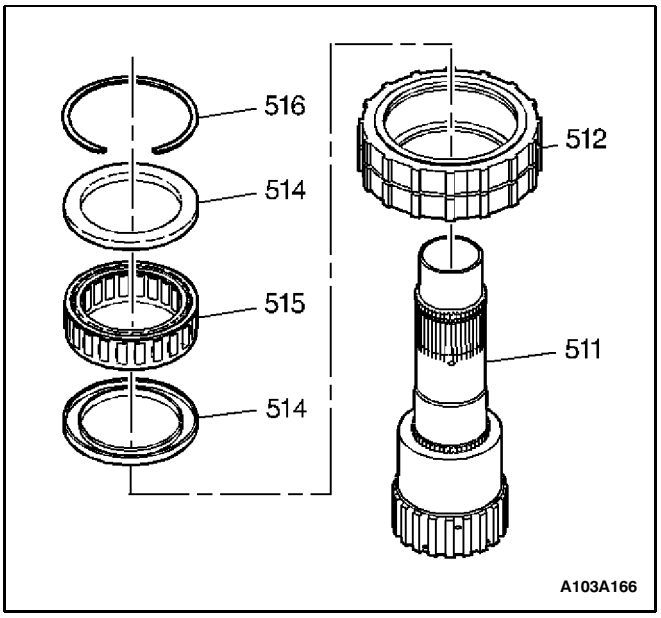


10. Compress the direct clutch spring assembly. Use the J 41232.
11. Assemble the direct clutch snap ring (520) into the input housing (502).
12. Remove the J 41232.



Important: Assemble the steel plates (508) with the splines in the input housing groove that are machined to the pistons.

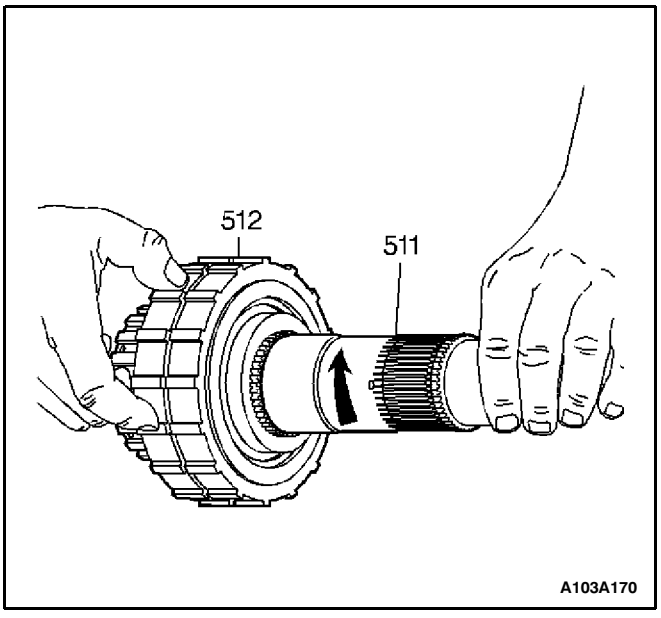
13. Assemble the 4 steel coast clutch plates (508) and the 4 new fiber coast plates (509) into the input housing in alternating order beginning with a steel plate (508).



14. Place the sprag outer race (512) on the bench with the flat side down and the side with the snap ring groove up.
15. Place one end bearing (514) into the outer race.
16. While rotating the sprag slowly, assemble the sprag clutch (515) into the sprag outer race. Keep the grooved edge up and the flat side down.
17. Assemble the other end bearing (514) on top of the sprag clutch.
18. Assemble the snap ring (516) into the sprag outer race (512) in order to retain the sprag clutch and end bearings.

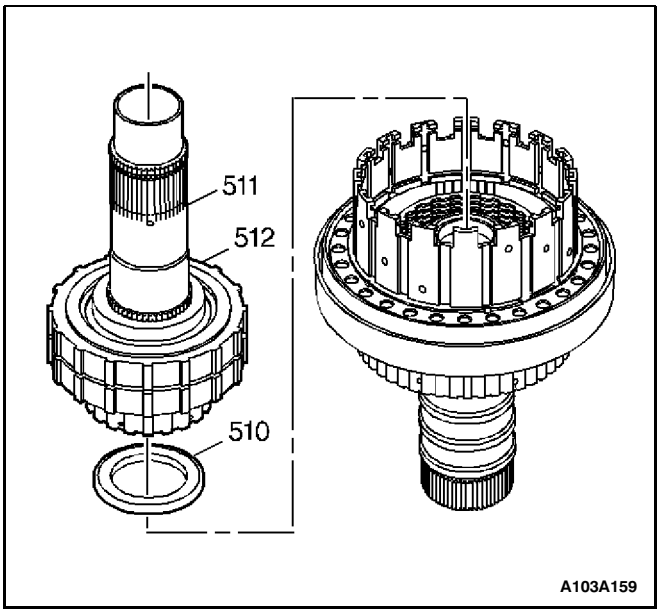
Important: The snap ring side of the assembly faces up when installing the sprag clutch onto the input sun shaft. The flat side of the sprag outer race functions as the backing plate for the coast clutch.

19. While rotating the input sun shaft clockwise in order to help seat the sprags, assemble the sprag clutch and outer race assembly onto the input sun shaft (511).

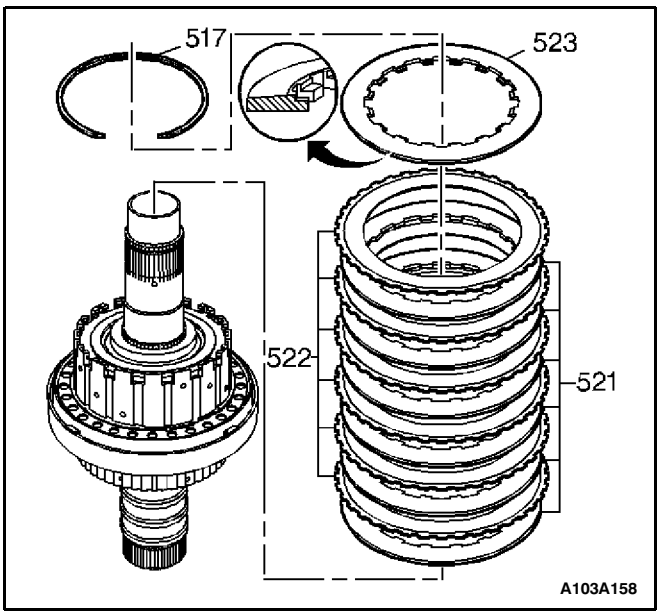


Important: The input sun shaft (511) must only rotate clockwise.

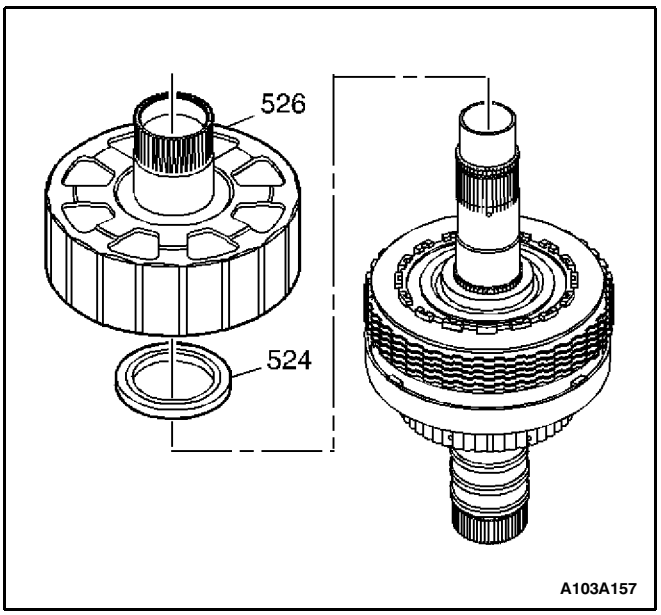
20. Verify the correct operation of the sprag clutch by holding the sprag clutch outer race (512) and rotating the input sun shaft (511).



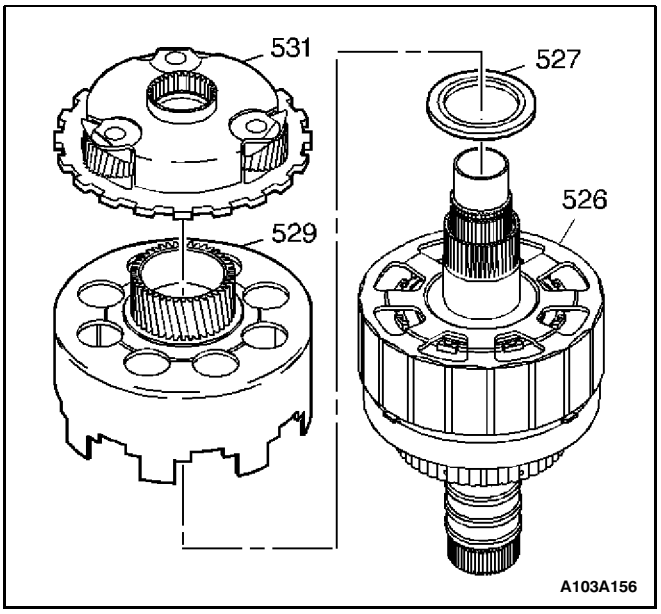
21. Assemble the thrust bearing (510) on the underside of the input sun shaft.
22. Retain the thrust bearing with J 36850 or equivalent.
23. Assemble the input sun shaft and sprag clutch assembly (511 and 512) into the input housing. The splines on the input sun shaft engage with the coast clutch fiber plates.



24. Assemble the steel (521) and new fiber (522) direct clutch plates into the input housing in alternating order beginning with a steel plate (521).
25. Assemble the direct clutch backing plate (523) onto the input housing with the flat side down.
26. Assemble the snap ring (517) in order to retain the input sun shaft and sprag clutch assembly and the direct clutch plates.



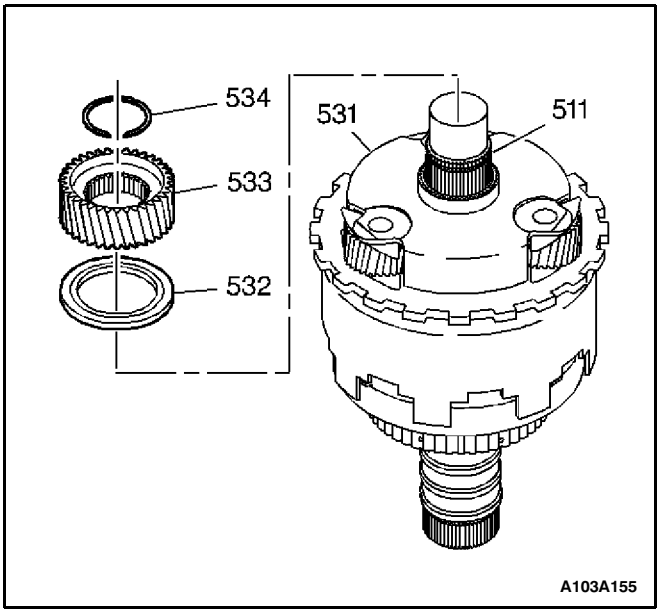
27. Assemble the thrust bearing (524) on the top of the sprag clutch assembly. Retain with J 36850 or equivalent.
28. Assemble the reaction carrier shaft and shell assembly (526) onto the input housing. The splines on the inside of the shell engage the direct clutch fiber plates.



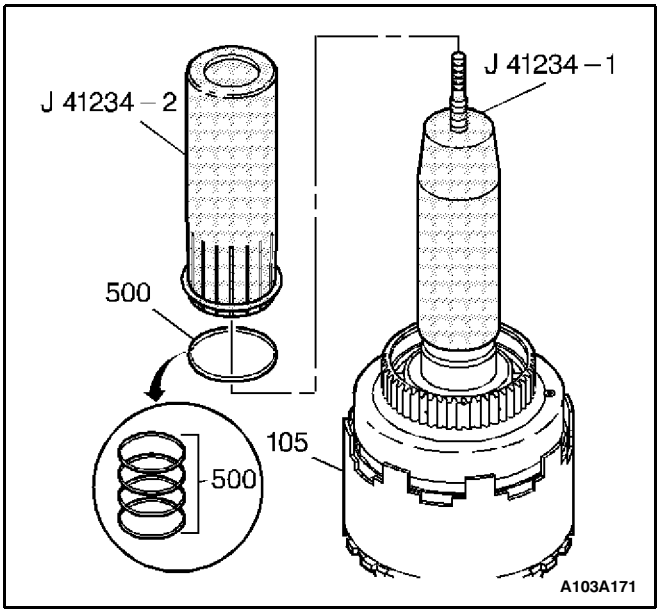
29. Assemble the thrust bearing (527) onto the top of the reaction carrier shaft and shell assembly.
30. Assemble the reaction carrier sun gear and shell assembly (529) onto the reaction shaft shell.

Important: Rotate the reaction carrier during assembly in order to mesh the sun gear with the pinion gears.

31. Assemble the reaction carrier assembly (531) onto the reaction sun gear.

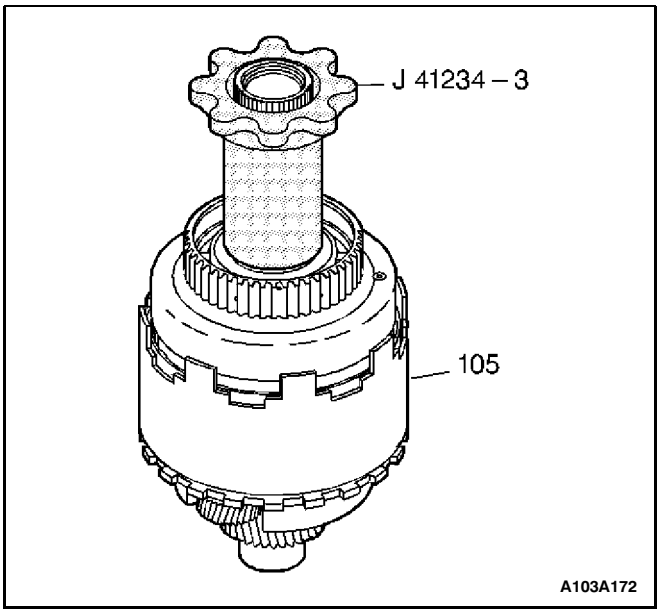


32. Assemble the reaction carrier assembly to input sun gear thrust bearing (532) onto the reaction carrier assembly.
33. Assemble the input sun gear (533) onto the input sun shaft.
34. Assemble the input sun gear snap ring (534) onto the input sun shaft.

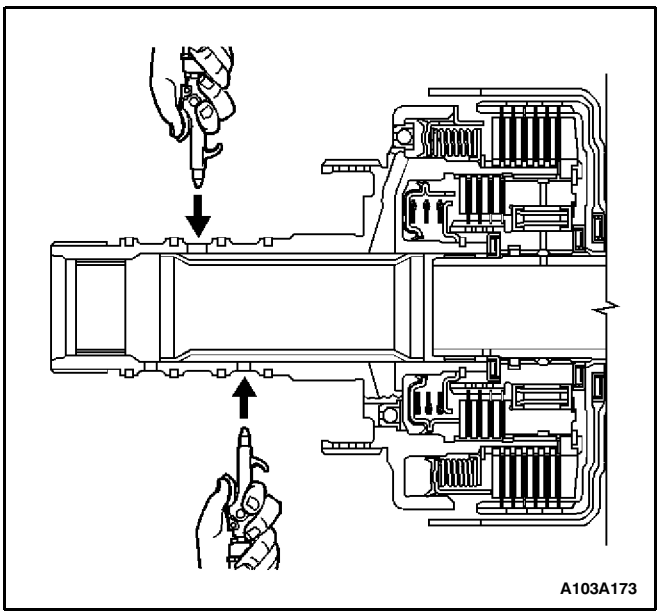


Important: When assembling the four new Teflon™ seals (500) onto the input shaft, begin with the seal closest to the housing.

35. Slide the J 41234-1 over the input shaft, and position the J 41234-1 at the seal groove closest to the housing. Coat the J 41234-1 with transmission fluid.
36. Guide a new seal onto the J 41234-1 and slide the seal into the seal groove with the J 41234-2.
37. Repeat the above procedure for each seal. Adjust the J 41234-1 as necessary for each seal groove.

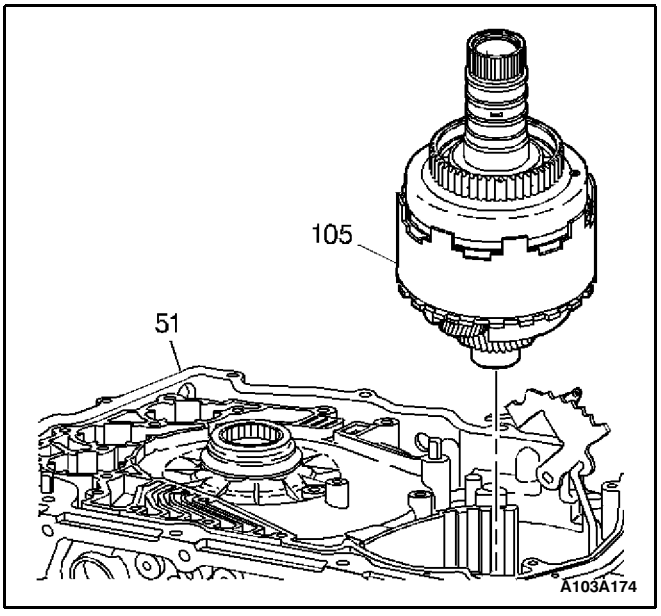


38. Size the seals with the J41234-3.
39. Leave the J 41234-3 in place for at least five minutes. If possible, leave the J 41234-3 in place until when you install the assembly into the transmission case.



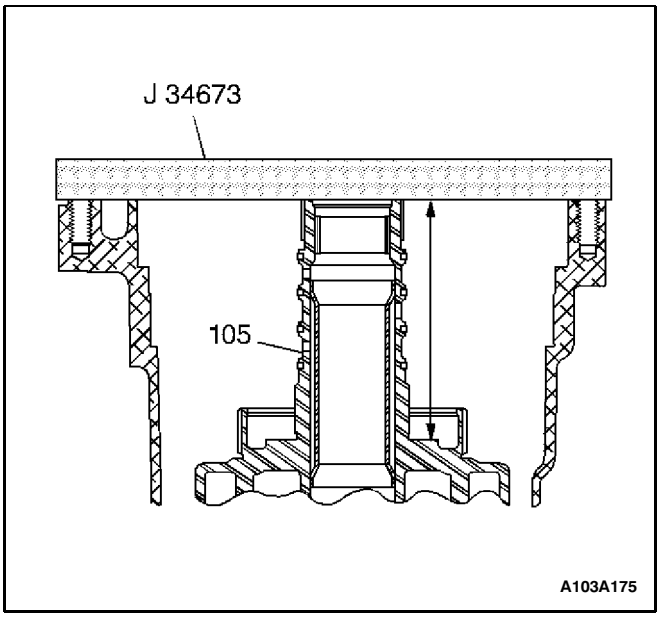
DIRECT AND COAST CLUTCH FUNCTIONAL AIR CHECKS

1. Air check the direct clutch in order to verify the proper operation of the seals and clutch assembly.
2. Air check the coast clutch in order to verify the proper operation of the seals and clutch assembly.



DIRECT/COAST CLUTCH, REACTION CARRIER INSTALL

Install the direct/coast clutch and reaction carrier assembly (105) into the transmission case (51).



SELECTIVE WASHER MEASUREMENT AND INSTALLATION

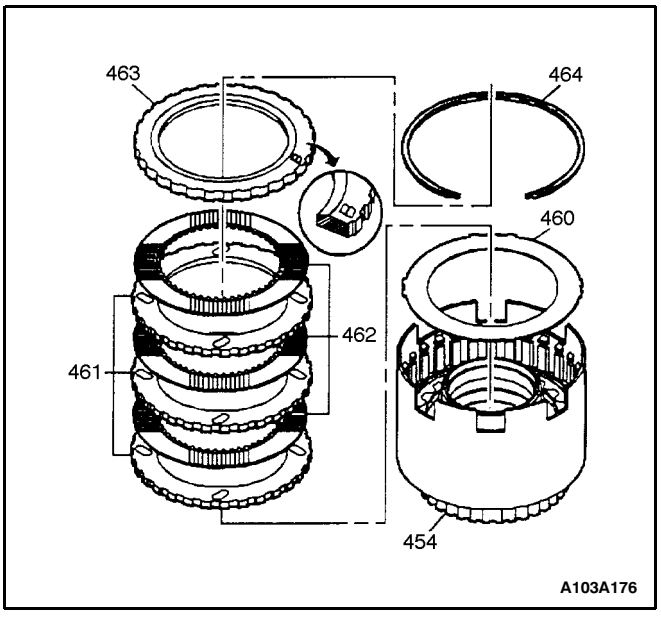
Tools Required

J 34673 Gage Block

1. **Place the J 34673 across the machined surface of the case.**
2. **Measure the distance between the top of the direct/ coast clutch housing (105) and the machined surface of the case (Dimension A).**
3. **Note the measurement of Dimension A and choose the correct selective washer. Refer to Selective Washer Table in End Play Specifications.**

Important: Position the tab on the thrust washer in the recessed area for the retainer and ball assembly (104).

4. **Assemble the selective washer (104) onto the top of the input housing.**
5. **Assemble the thrust bearing (103) over the input shaft and onto the top of the selective thrust washer (104).**



REVERSE INPUT AND 2ND ROLLER CLUTCH DISASSEMBLE

Tools Required

J 41232 Return Spring Compressor

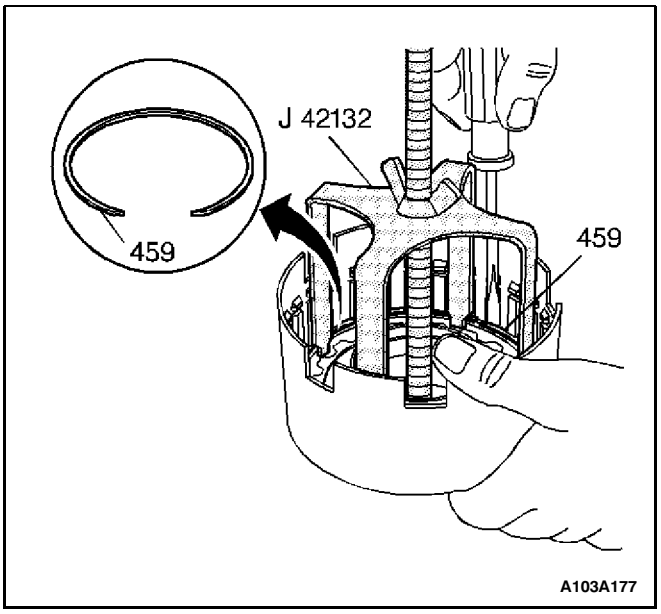
J 41097-1 Inner Seal Remover Adapter

J 41097-2 Inner Seal Remover Adapter Ring

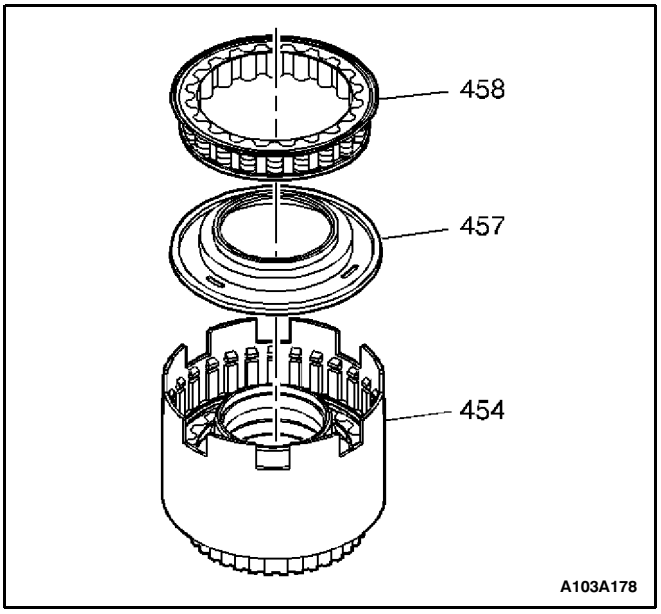
J 25031-A Inner Seal Remover

J 4646 Internal Snap Ring Pliers

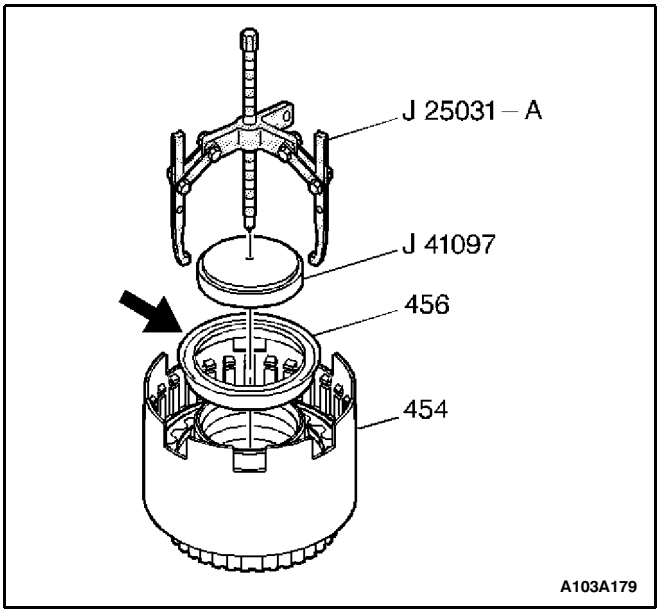
1. **Remove the reverse clutch snap ring (464).**
2. **Remove the reverse clutch plates (one backing plate (463)l, three steel plates (461), three fiber plates (462), and a waved plate (460)).**



3. Compress the reverse clutch return spring. Use the J 41232.
4. Remove the reverse clutch return spring and the retainer snap ring (459).
5. Remove the J 41232.

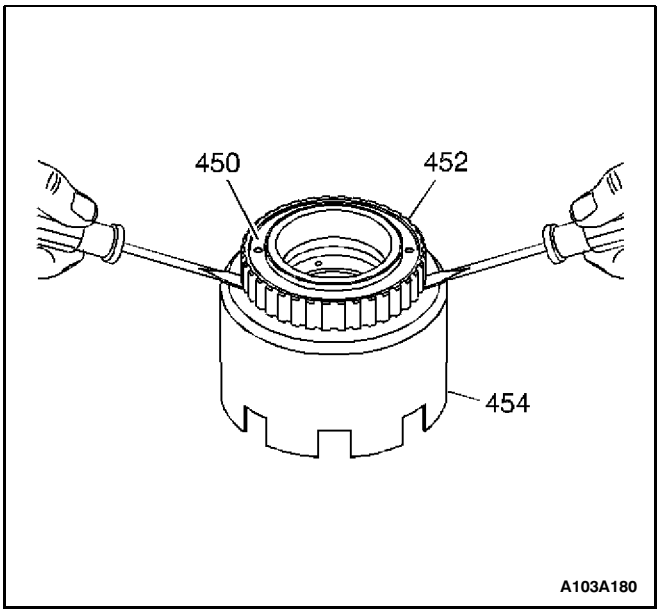


6. Remove the reverse clutch return spring and retainer assembly (458).
7. Remove the reverse clutch piston and seal assembly (457).



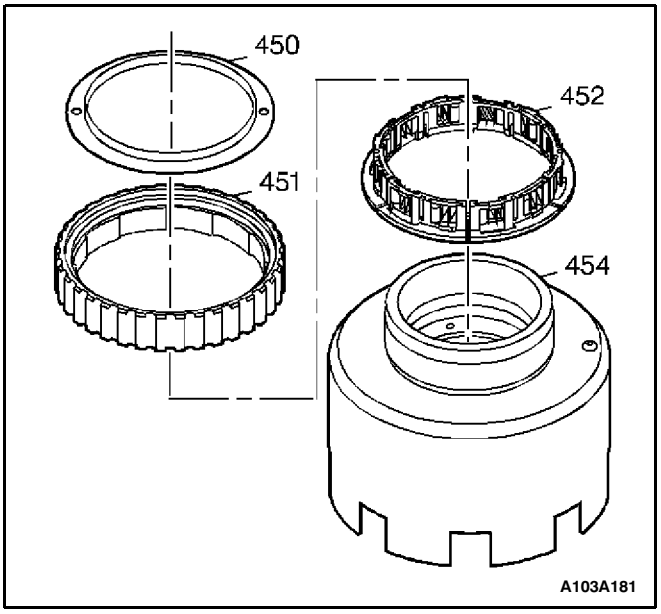
Important: If the seal assembly is not damaged do not remove the seal assembly.

8. Inspect the reverse clutch inner seal (456).
9. If the seal assembly is damaged, perform the following procedure in order to remove the seal assembly:
   - 9.1. Attach the J 41097-1 (not shown in the illustration) to the J 41097-2.
   - 9.2. Place the J 41097-2 on the inner hub of the reverse clutch housing (454).
   - 9.3. Use the J 4646 or equivalent in order to install the J 41097-2 under the outer lip of the reverse clutch inner seal (456).
   - 9.4. Use the puller J 25031-A in order to remove the seal.

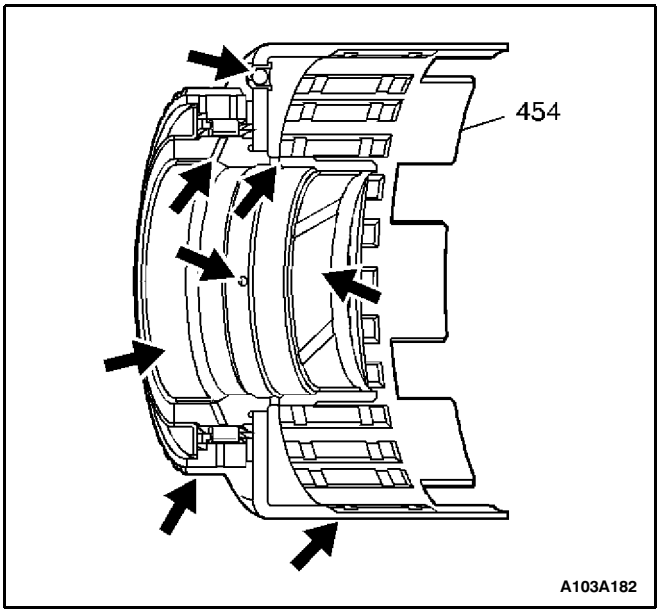


Important: Be careful when removing the second roller clutch not to score the roller clutch inner race with the screwdrivers.

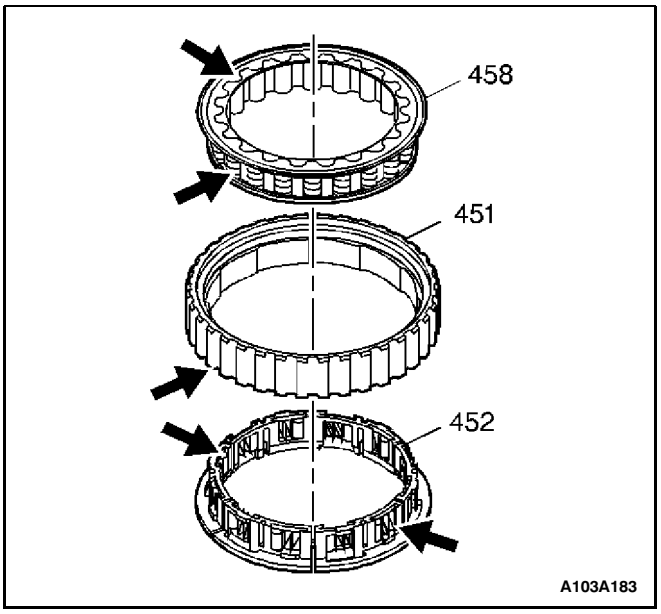
10. **Remove the 2nd roller clutch (452) and roller clutch retainer (450) by prying up on the roller clutch assembly with two screwdrivers. The second roller clutch retainer is pressed onto the reverse clutch housing (454) and is not reusable after removal.**



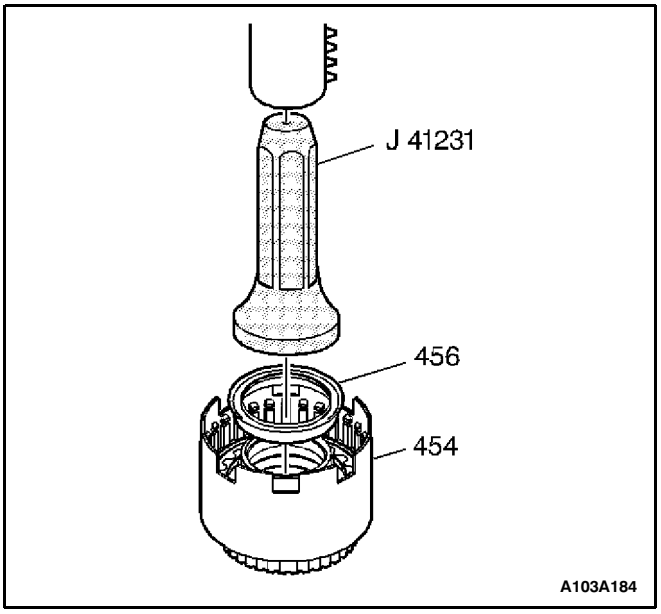
11. **Remove the 2nd roller clutch (452) from the inside of the roller clutch cam (451).**



12. **Inspect the reverse housing for excessive band wear and damaged splines.**
13. **Inspect the retainer and ball capsule for damage or clogging.**
14. **Inspect the fluid feed holes for proper opening.**



15. Inspect the roller clutch for excessive wear (451 and 452).
16. Inspect the spring assembly for dislocated or damaged springs (458).
17. Inspect all components for damage and excessive wear.
18. Clean and dry each of the components.



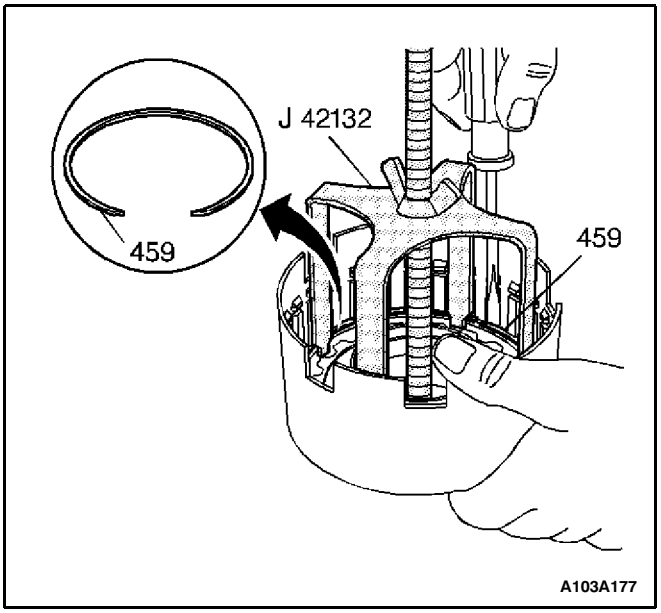
REVERSE INPUT AND 2ND ROLLER CLUTCH ASSEMBLE

Tools Required

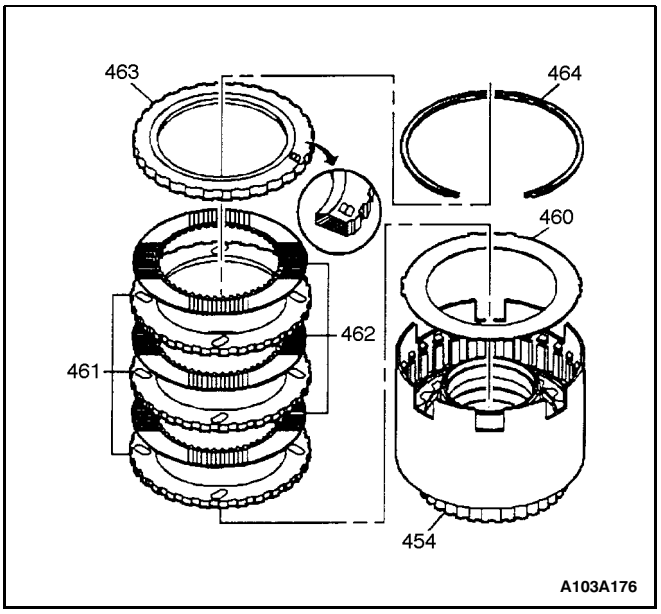
J 41232 Return Spring Compressor

J 41233 Inner Seal Installer

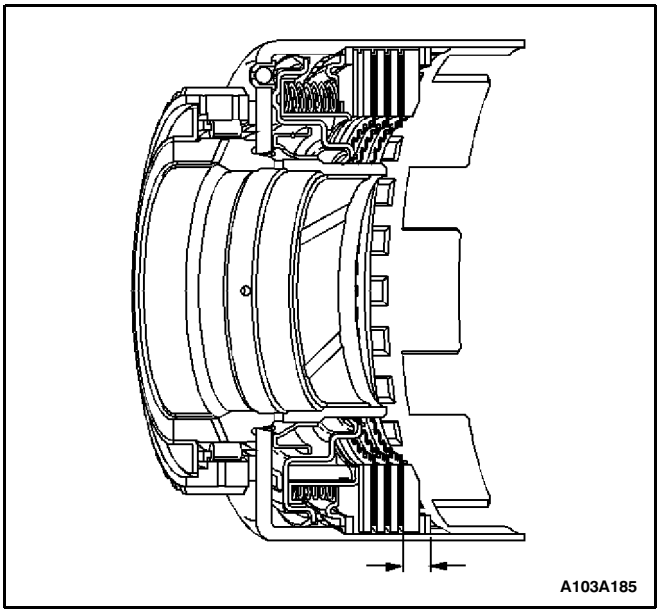
1. If the reverse clutch inner seal assembly (456) was damaged and removed, install a new reverse clutch inner seal assembly (456). Use the J 41233.
2. Assemble the reverse clutch piston and seal assembly (457). In order to aid in the assembly, lubricate the seal with transmission fluid.
3. Assemble the reverse clutch return spring and retainer assembly (458) with the smaller outside diameter down.



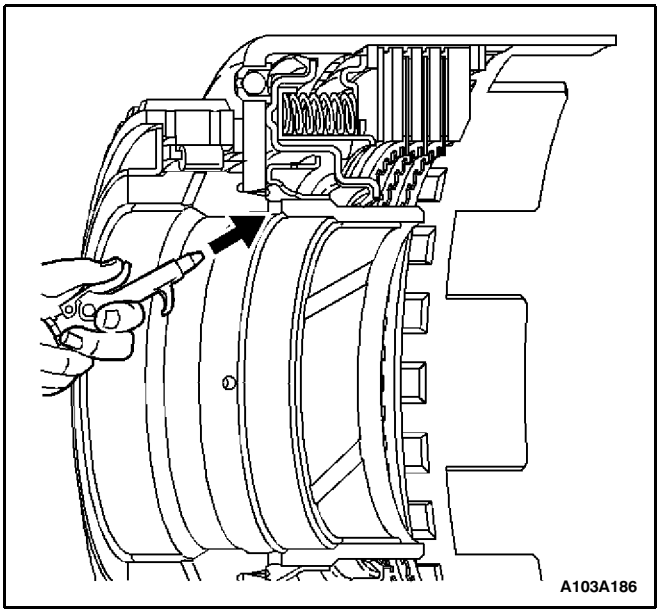
4. Compress the reverse clutch return spring. Use the J 41232.
5. Assemble the return spring snap ring (59).
6. Remove the J 41232.



7. Assemble the wave plate (460).
8. Assemble the three steel plates (461) and the three new fiber plates (462) in alternating order beginning with a steel plate (461).



9. Measure the distance between the top of the snap ring groove and the top friction plate (Dimension A).
10. In order to select the appropriate backing plate, use Dimension A. You will find the backing plate identification stamped onto the beveled side of the backing plate. Refer to the Reverse Clutch Table in Transaxle General Specifications.
11. Assemble the reverse clutch backing plate (463) with the beveled edge up.
12. Assemble the snap ring (464) in the reverse clutch housing in order to retain the reverse clutch plates.

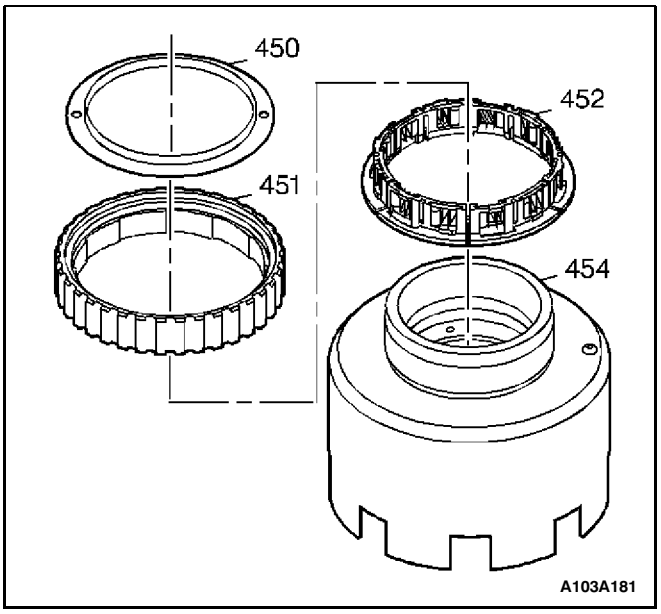


REVERSE CLUTCH FUNCTIONAL AIR CHECK

Tools Required

J 41235 Second Roller Clutch Installer

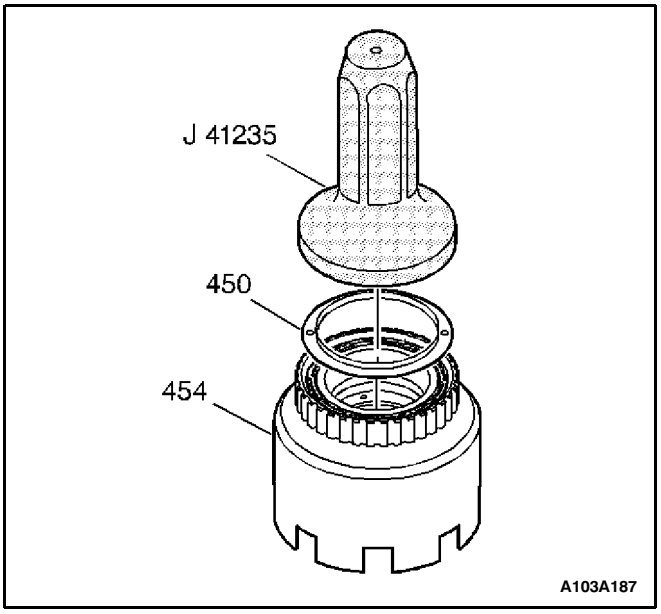
1. Air check the reverse clutch in order to verify the proper operation of the seals and clutch assembly.



2. Assemble the 2nd roller clutch assembly (452) into the roller clutch cam (451).

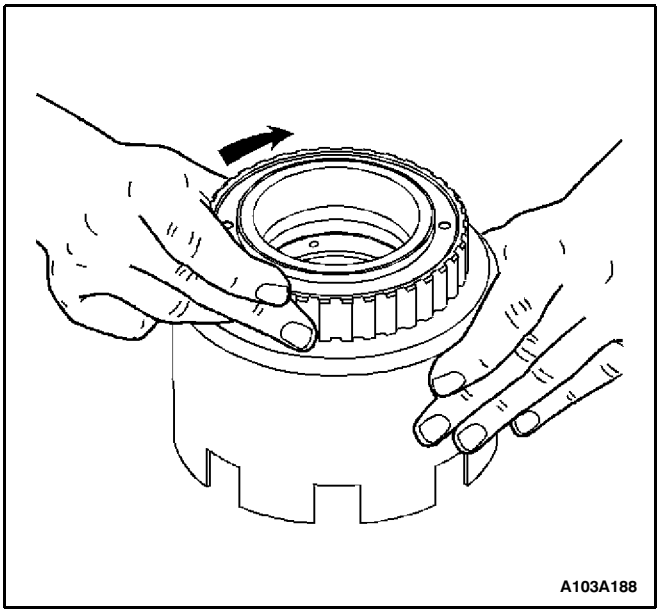
Important: When installing the 2nd roller clutch assembly onto the reverse clutch housing, the flat side of the roller clutch cam faces down toward the housing (454).

3. While rotating the roller clutch in order to properly engage the rollers, assemble the 2nd roller clutch onto the reverse clutch housing (454).

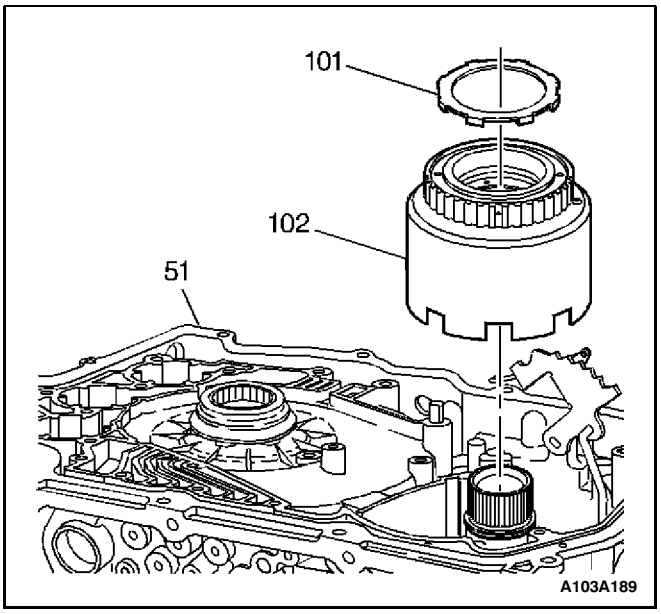


Important: The J 41235 will press the roller clutch assembly to a specified depth. If you install the 2nd roller too far down onto the inner race, the roller clutch may not operate properly.

4. Assemble a new 2nd roller clutch retainer (450) onto the 2nd roller clutch assembly. Use the J 41235 in order to press the retainer and roller clutch assembly into place on the reverse clutch housing and roller clutch inner race.



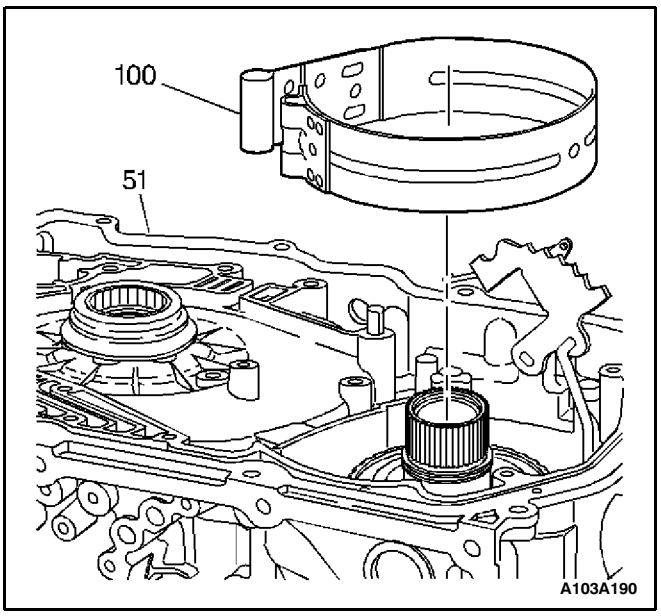
5. Hold the reverse clutch housing and ensure that the roller clutch cam rotates clockwise only.



REVERSE INPUT AND 2ND ROLLER CLUTCH INSTALL

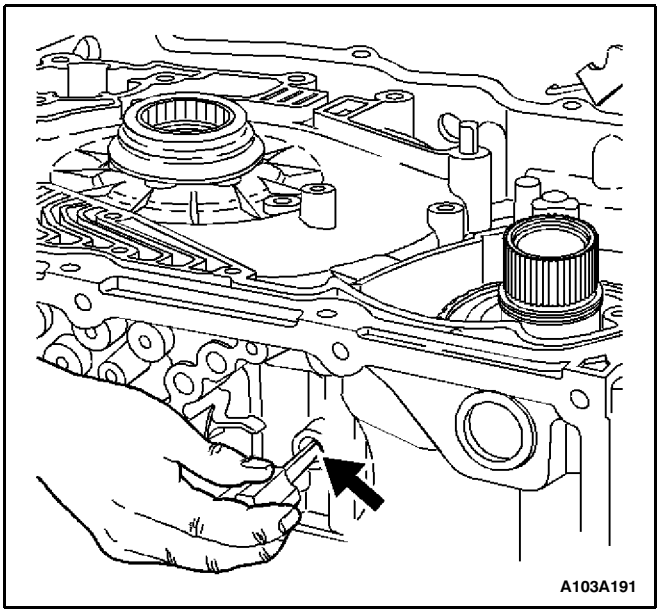
Important: The tangs on the reverse clutch housing spline to the tangs on the reaction carrier sun gear and shell assembly.

1. **While rotating the reverse clutch housing in order to align the clutch plates, install the reverse clutch and 2nd roller clutch assembly into the transmission case.**
2. **Assemble the reverse clutch thrust washer (101) onto the top of the 2nd roller clutch. The tabs must face down onto the housing.**

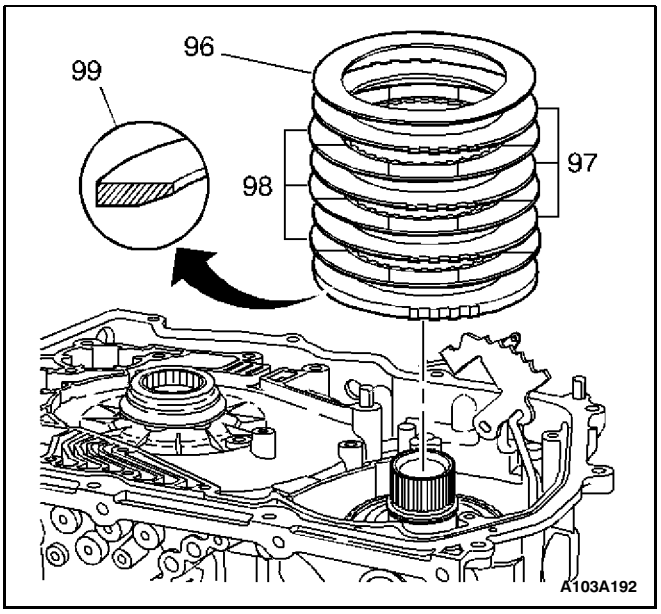


INTERMEDIATE 4TH BAND ASSEMBLY INSTALL

1. **Assemble a new intermediate/fourth band (100) into the transmission case (51).**

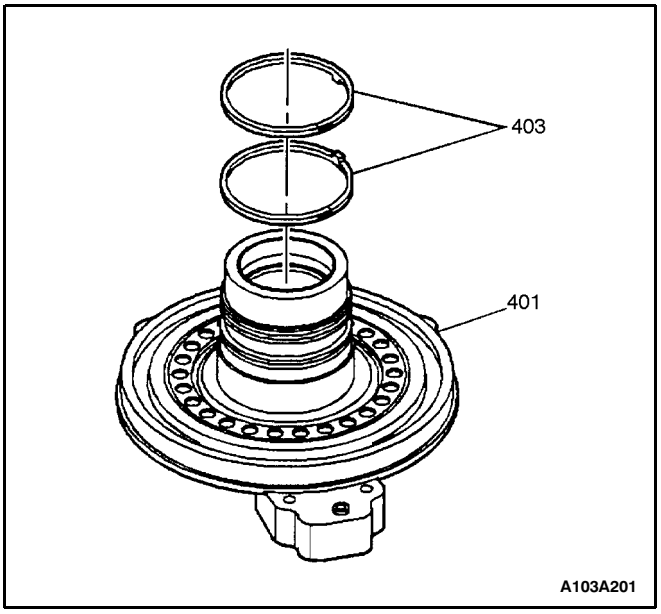


2. **In order to verify the proper positioning of the band, insert a screwdriver through the intermediate/fourth servo bore. The screwdriver should press on the servo pin rest and compress the band around the reverse clutch housing.**



2ND CLUTCH PLATE INSTALLATION

1. Inspect the 2nd clutch plates for excessive wear.
2. Clean and dry each of the components.
3. Assemble the 2nd clutch backing plate (99) with the flat side facing up.
4. Assemble the three steel (97) and the three new fiber plates (98) in alternating order beginning with a fiber plate (98).
5. Assemble the 2nd clutch wave plate (96).

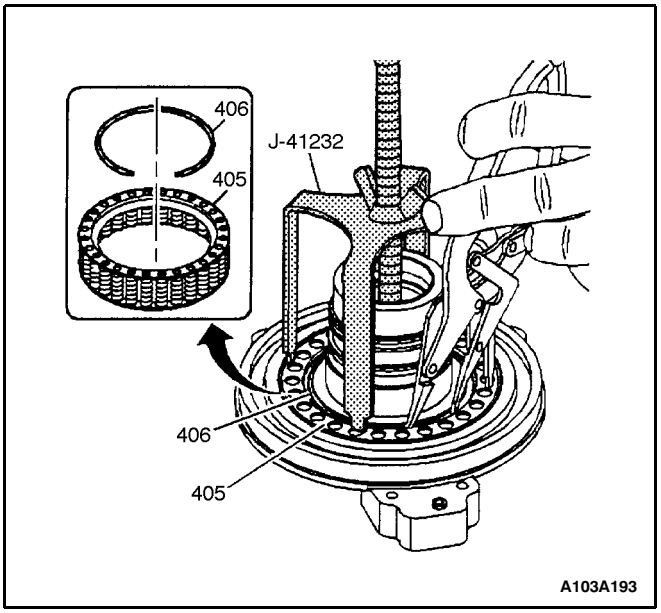


DRIVEN SPROCKET ASSEMBLY DISASSEMBLE

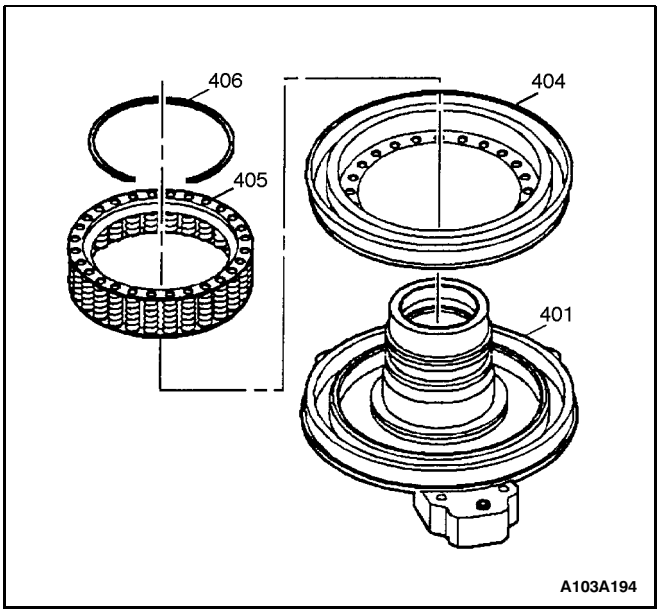
Tools Required

J 41232 Return Spring Compressor

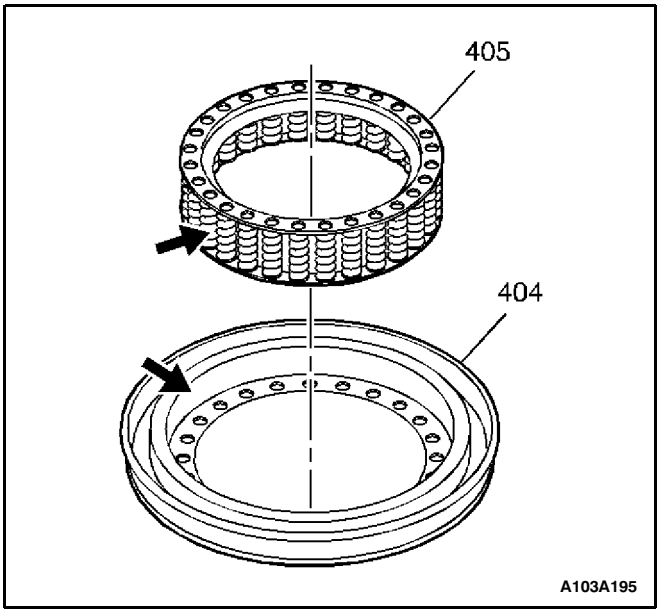
1. Remove the two seal rings (403) from the driven sprocket support.
2. Discard the two seal rings (401).



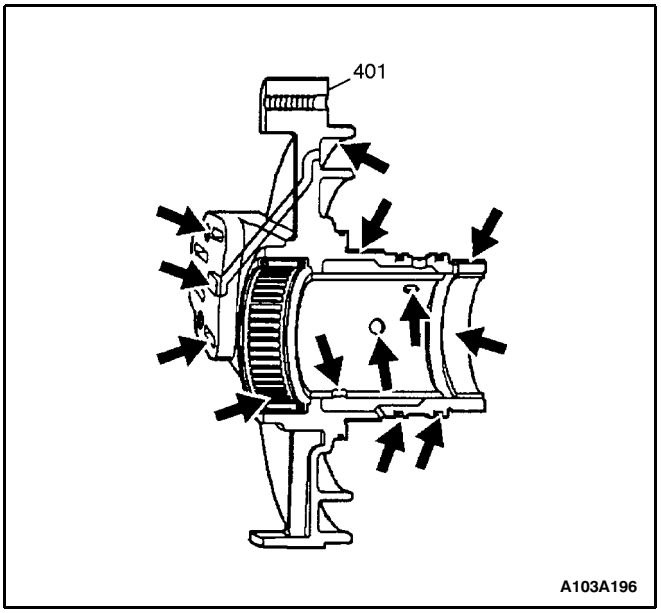
3. Compress the 2nd clutch spring and retainer assembly (405). Use the J 41232.
4. Remove the 2nd clutch spring retainer snap ring (406).
5. Remove the J 41232.



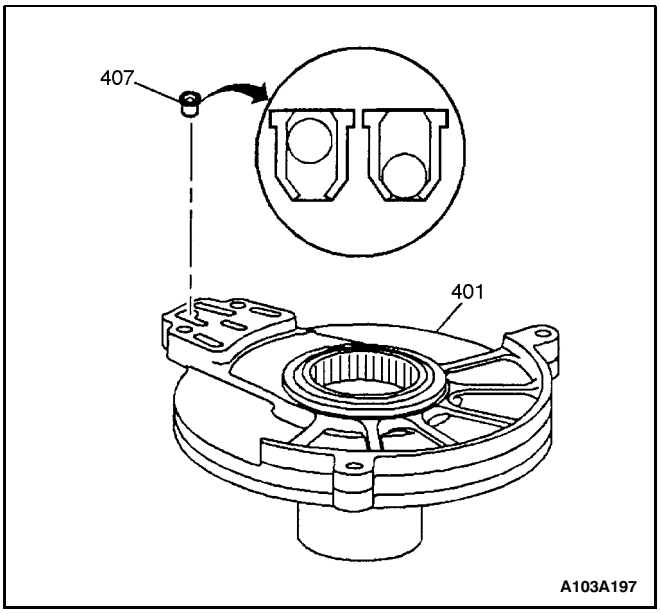
6. Remove the 2nd clutch spring and retainer assembly (405).
7. Remove the 2nd clutch piston and seal assembly (404). If not damaged, the piston and seal assembly is reusable.



8. Inspect the piston and seal assembly for damaged seals.
9. If the seal is cut or damaged replace the seal with a new piston and seal assembly.



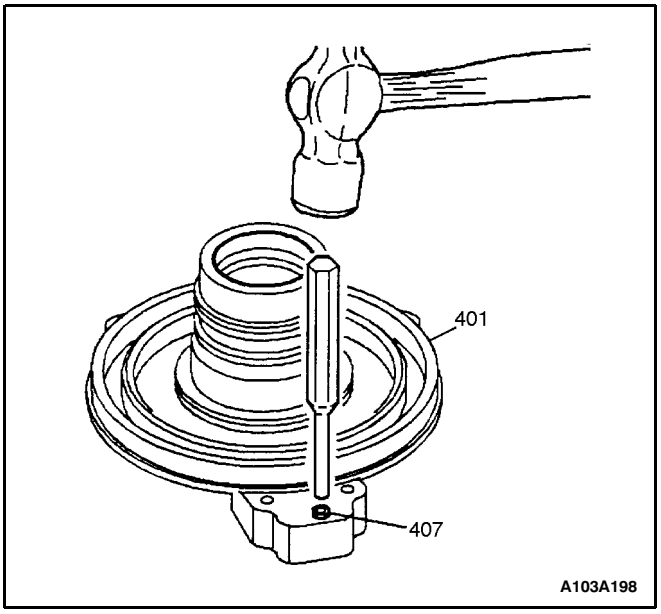
10. Inspect the bushing and bearing for damage or excessive wear.
11. Inspect the driven sprocket support for plugged feed holes, damaged seal grooves, stripped bolt holes, and a damaged machined surface.



12. Inspect the reverse intermediate clutch housing valve assembly (407) for free operation.

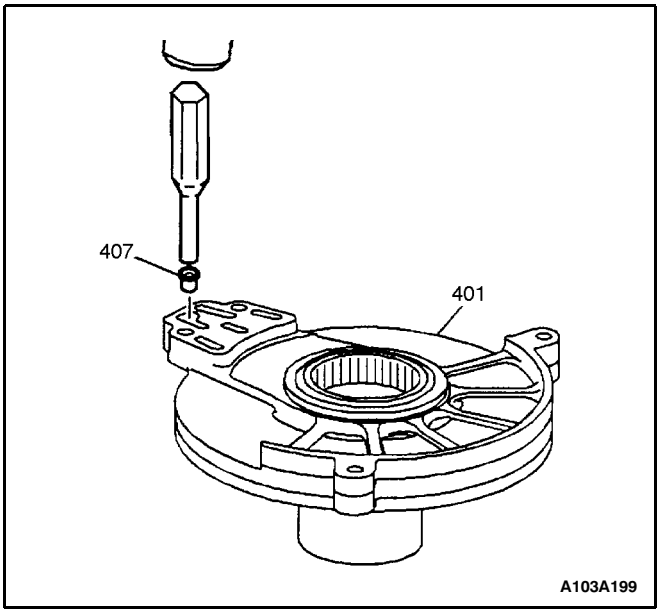
Important: The valve assembly must be in its seated position before you perform the leak test.

13. Using automatic transmission fluid, inspect the reverse intermediate clutch housing valve assembly (407) for leaks.

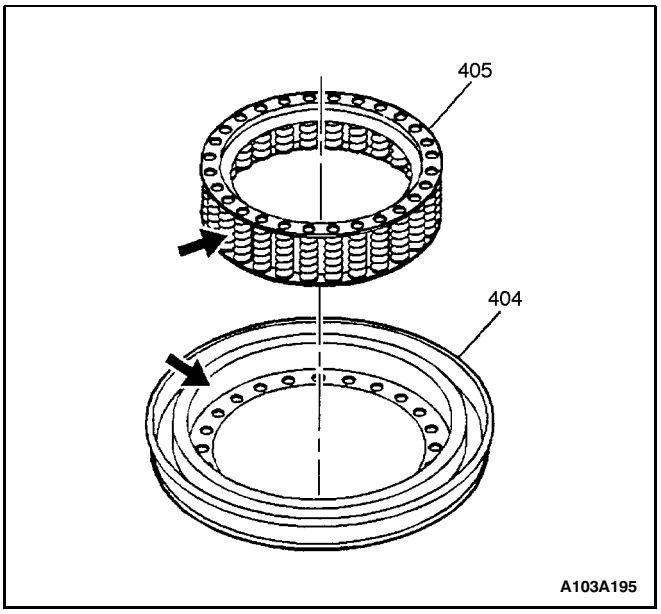


Important: Remove the reverse clutch housing valve assembly (407) only if inspection or the leak test has indicated a problem.

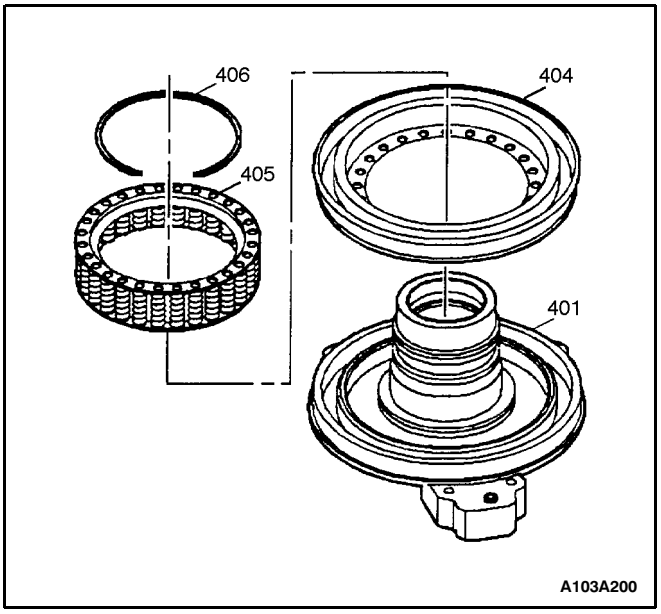
14. Using a 6.25 mm (1/4 inch) drift and a mallet, remove the valve assembly (407) from the driven sprocket support (401).



15. Using a 6.25 mm (1/4 inch) drift and a mallet, install the valve assembly (407) in the driven sprocket support (401).



16. Inspect the spring assembly for dislocated or damaged springs.
17. Clean and dry each of the components.

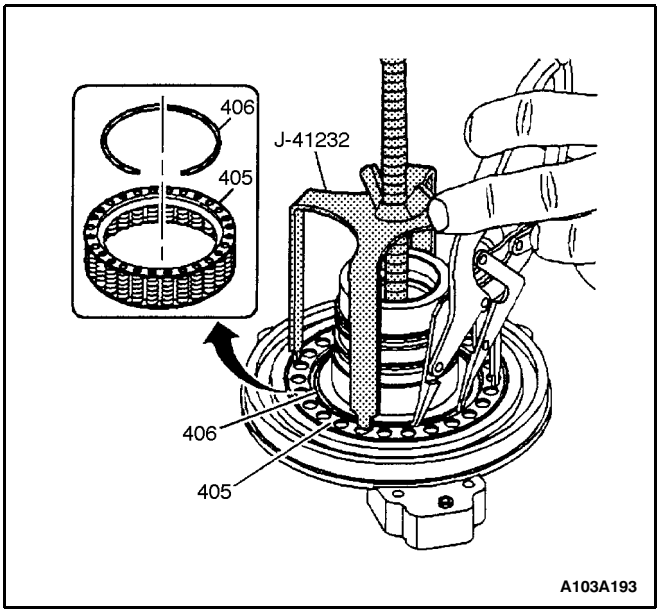


DRIVE SPROCKET SUPPORT ASSEMBLE

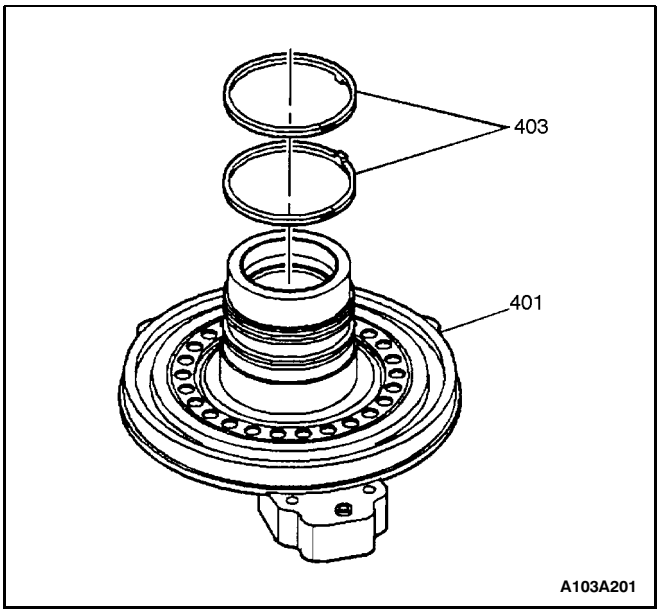
Tools Required

J 41232 Return Spring Compressor

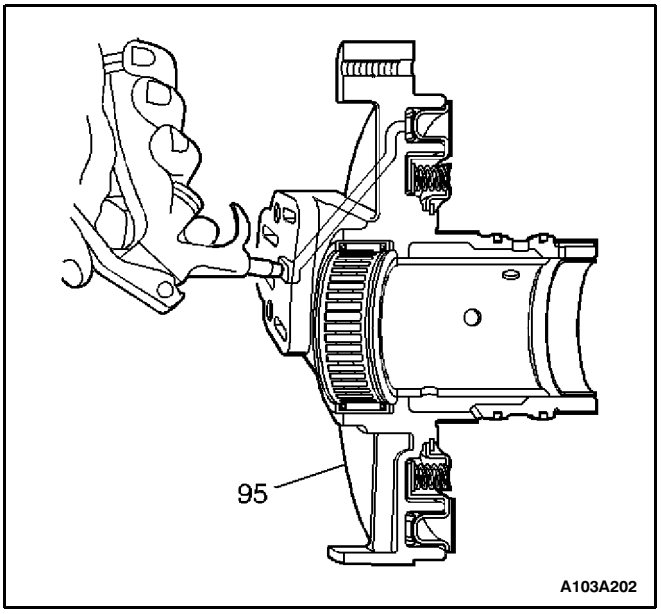
1. In order to aid in the assembly, lubricate the seal with transmission fluid.
2. Assemble the 2nd clutch piston and seal assembly (404) into the driven sprocket support (401).
3. Assemble the 2nd clutch spring and retainer assembly (405) into the driven sprocket support.



4. Compress the 2nd clutch spring assembly. Use the J 41232.
5. Assemble the 2nd clutch spring retainer snap ring (406).
6. Remove the J 41232.

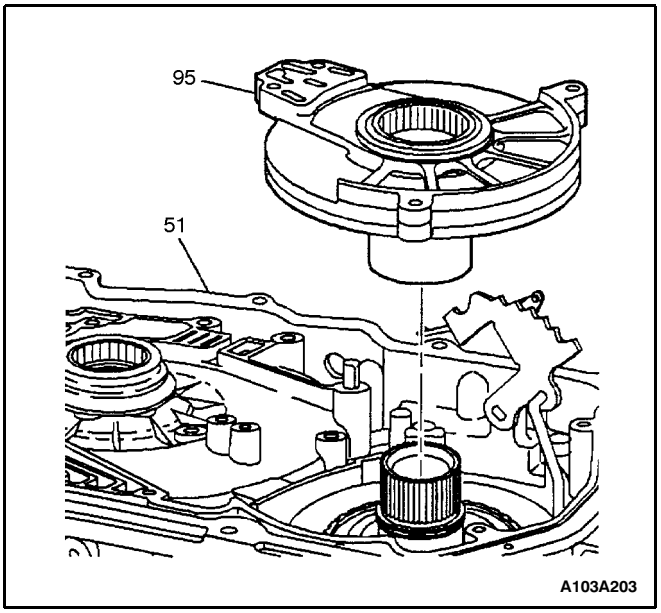


7. Assemble two new seal rings (403) onto the driven sprocket support.



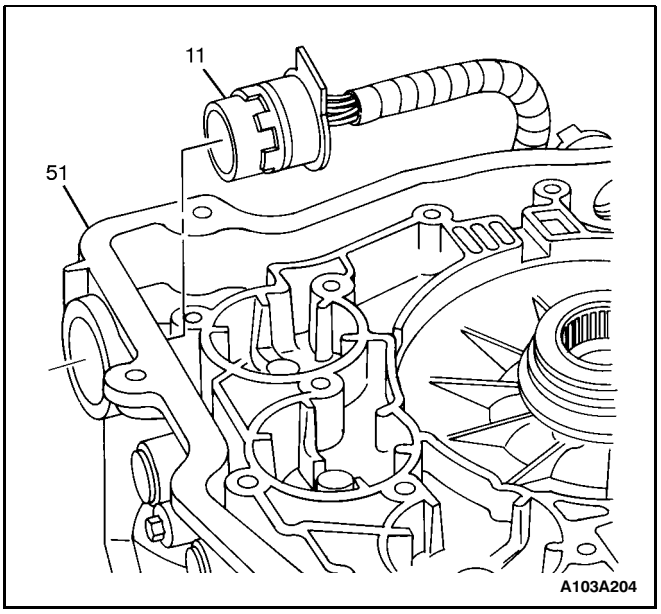
2ND CLUTCH FUNCTIONAL AIR CHECK

Air check the 2nd clutch in order to verify proper operation of the seals and clutch assembly.



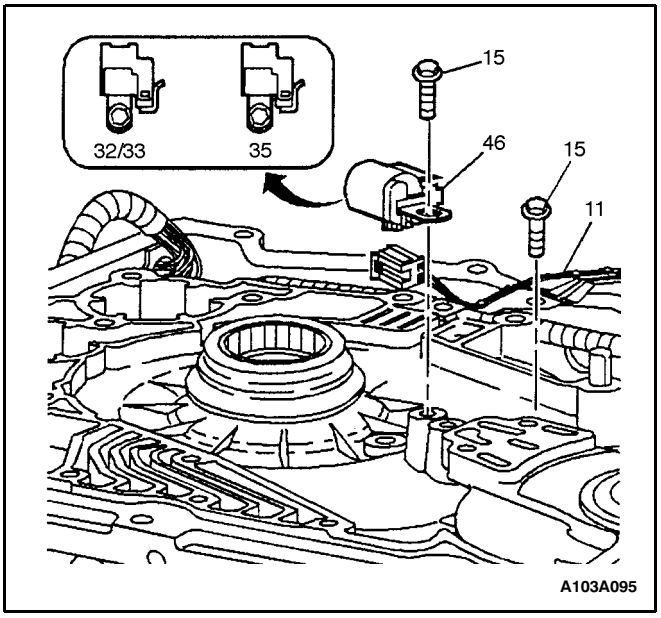
DRIVEN SPROCKET SUPPORT ASSEMBLY INSTALLATION

Install the driven sprocket support and 2nd clutch assembly (95) into the transaxle case (51). When installed properly, the driven sprocket support sits slightly below the machined surface of the transaxle case (51).



WIRING HARNESS INSTALLATION

1. Inspect the wiring harness (11) for damage.
2. Inspect the pass thru connector pins and O-ring seal for damage.
3. Assemble the wiring harness pass thru connector into the transaxle case bore from the inside of the transaxle case.

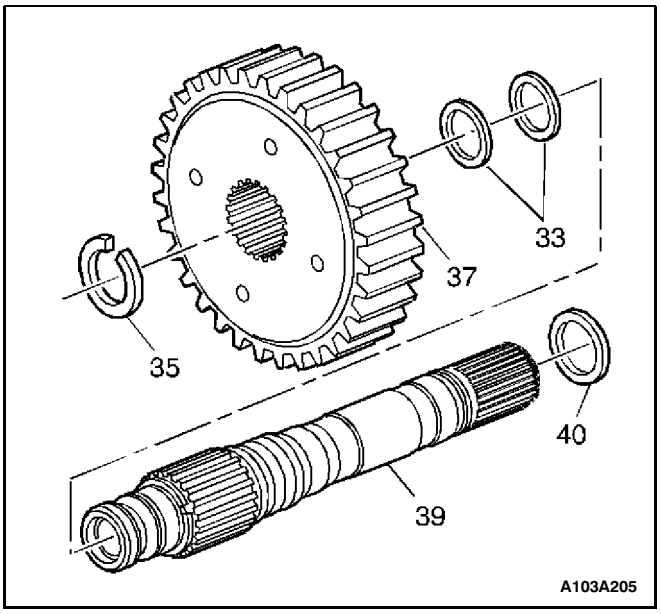


INPUT SPEED SENSOR INSTALL

Important: The tab on the sensor housing (46) fits into the recess on the case boss.

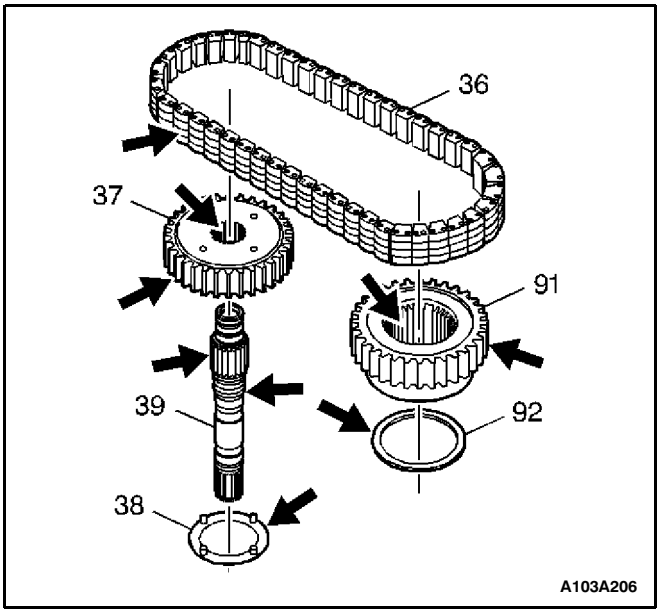
Important: For drive sprockets with 35 teeth, use a black sensor housing. For drive sprockets with 32 or 33 teeth, use a natural colored sensor housing.

1. Assemble the input speed sensor (46) to the transmission case (51).
2. Install the input speed sensor bolt (15). Hand start and tighten the input speed sensor bolt to 12 N•m (9 lb-ft).
3. Route the input speed sensor wiring harness in the case channel.
4. Connect the input speed sensor connector to the input speed sensor.
5. Install the wire harness retainer and wire harness retainer bolt. Tighten the wire harness retainer bolt to 12 N•m (9 lb-ft).

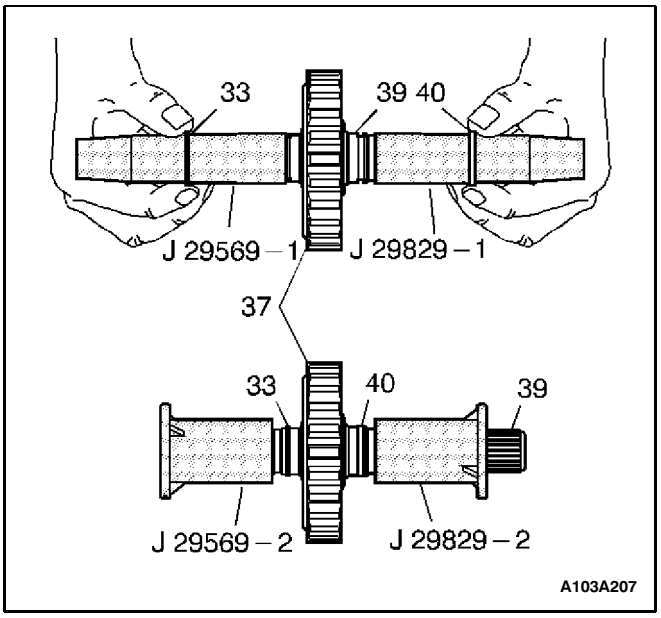


DRIVE, DRIVEN SPROCKETS AND DRIVE LINK DISASSEMBLE

1. Remove the turbine shaft to drive sprocket snap ring (35).
2. Remove the drive sprocket (37) from the turbine shaft (39).
3. Remove the three Teflon™ seals (33 and 40) from the turbine shaft.
4. Discard the Teflon™ seals (33 and 40).



5. Inspect the drive sprocket, the driven sprocket, the drive link assembly, and the turbine shaft for damage or excessive wear.
6. Inspect the seal grooves for damage.
7. Inspect the thrust washers for damage or excessive wear.
8. Clean and dry each of the components.



DRIVE, DRIVEN SPROCKETS AND DRIVE LINK ASSEMBLE

Tools Required

J 29569-1/J 29829-1 Turbine Shaft Seal Installer

J 29569-2/J 29829-2 Turbine Shaft Seal Sizer

1. In order to assemble three new Teflon™ seals onto the turbine shaft, perform the following procedure:

1.1. Slide both halves of the J 29569-1/J 29829-1 over the turbine shaft.

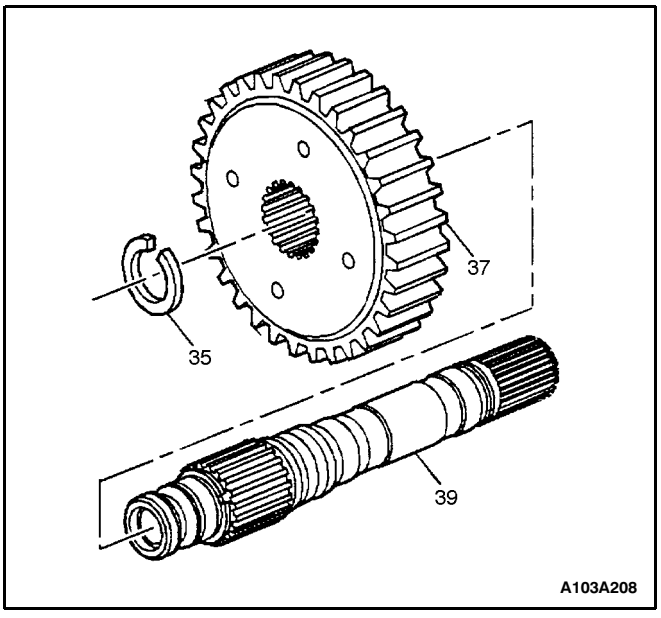
1.2. Coat the J 29569-1/J 29829-1 with transmission fluid.

1.3 Use your fingers in order to guide the new Teflon™ seals over the J 29569-1/J 29829-1 and into the seal ring grooves on the turbine shaft.

1.4. Remove the J 29569-1/J 29829-1 when the seals are in place.

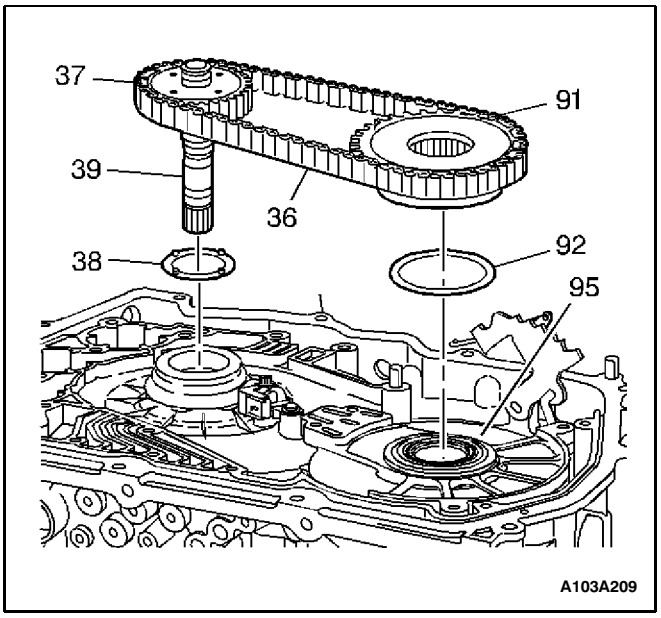
1.5. Size the new Teflon™ seals. Use both halves of the J 29569-2/J 29829-2.

1.6. In order to properly size the seals, keep the J 29569-2/J 29829-2 in place for five minutes.



2. Assemble the drive sprocket (37) onto the turbine shaft (39).

3. Retain the drive sprocket with the turbine shaft to drive sprocket snap ring (35).



DRIVE, DRIVEN SPROCKETS AND DRIVE LINK INSTALL

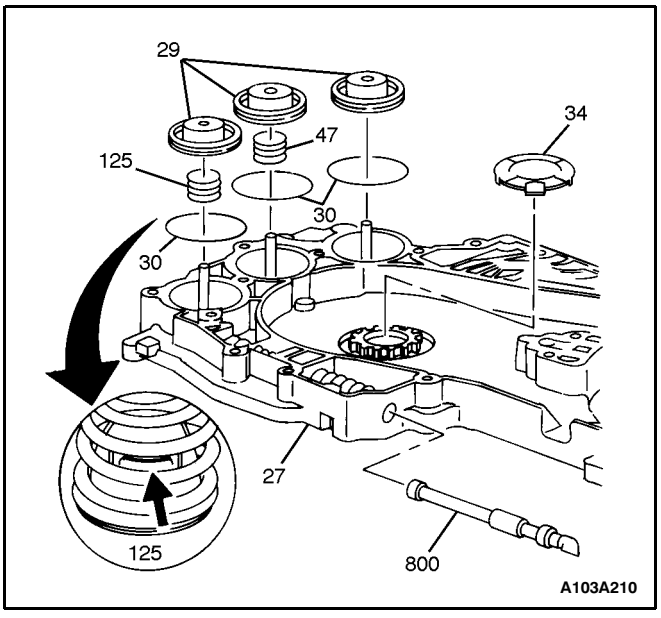
Tools Required

J 36850 Transjel™

1. **Install the drive sprocket to drive sprocket support thrust washer (38) to the drive sprocket (37). Place the tabs on the thrust washer into the holes on the drive sprocket.**
2. **Retain the thrust washer with J 36850 or equivalent.**
3. **Install the driven sprocket to driven sprocket support thrust washer (92) onto the driven sprocket support (95).**

Important: Orient the drive link assembly (36) in the same direction in which the drive link assembly (36) was removed. If the drive link assembly (36) is new, you can install it in either direction.

4. **Install the drive link assembly (36) to the drive and driven sprockets (37 and 91).**
5. **Install as a complete assembly, the drive sprocket (37), the driven sprocket (91), and the drive link assembly (36) onto the transmission.**



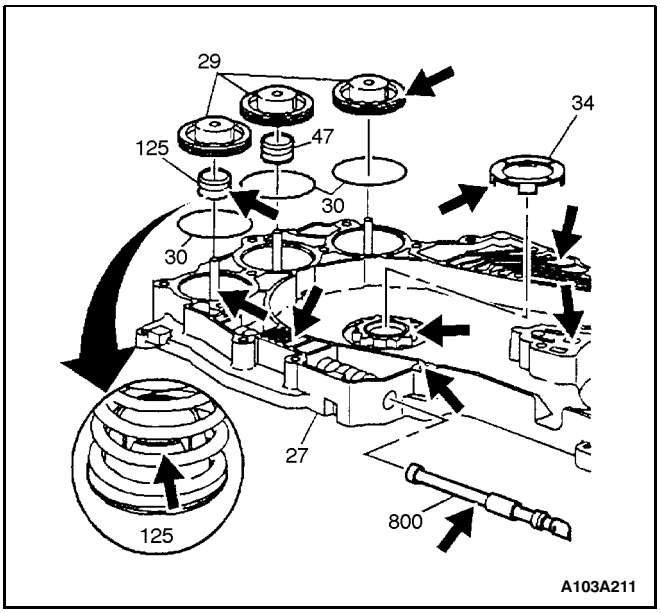
CHANNEL PLATE ASSEMBLY DISASSEMBLE

Important: The accumulator pins are pressed into the channel plate (27). Do not remove the accumulator pins.

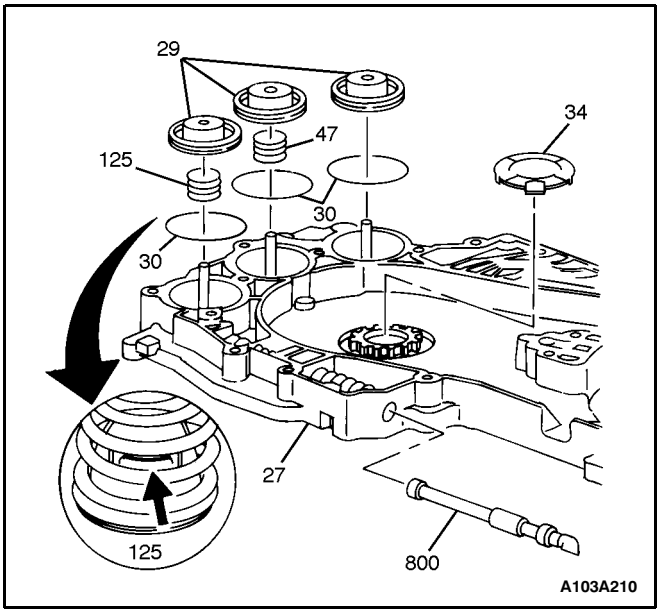
1. **Remove the three accumulator pistons (29) from the channel plate (27).**

Important: The 1-2 accumulator assist spring (125) has a retainer that presses into the spring. Keep the retainer and the spring together as an assembly.

2. **Remove the 1-2 accumulator assist spring 9125).**
3. **Remove the 2-3 accumulator assist spring (47).**
4. **Remove the seals (30) from the accumulator pistons (29).**
5. **Discard the accumulator piston seals (30).**
6. **Remove the manual valve (800) from the channel plate (27).**



7. Inspect the channel plate (27) for damage.
8. Inspect the channel plate (27) passages for debris.
9. Inspect the accumulator pistons (29), the assist springs (47 and 125), and the pins for damage.
10. Inspect the channel plate sleeve for wear from the turbine shaft.
11. Inspect the channel plate (27) bolt holes for stripped threads and debris.
12. Inspect the channel plate machined surface for nicks or scratches that could cause a fluid leak.
13. Inspect the manual valve (800) for freedom of movement.
14. Inspect the drive sprocket to channel plate thrust washer (34).
15. Clean and dry each component.

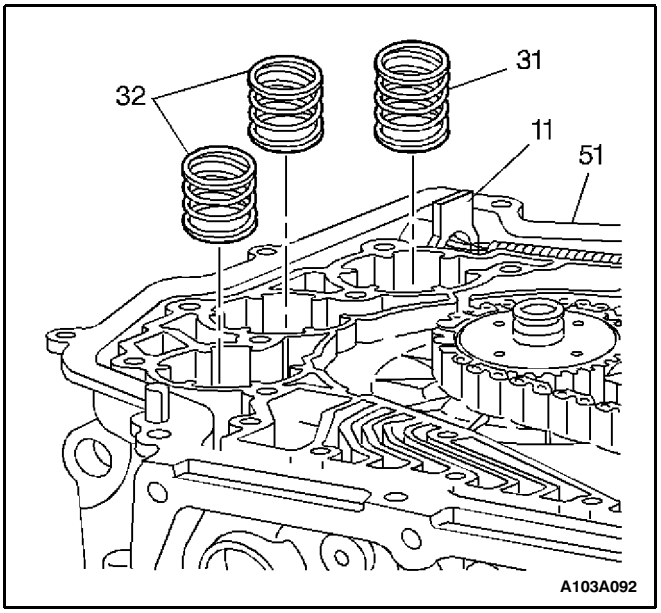


CHANNEL PLATE ASSEMBLY ASSEMBLE

Tools Required

J 36850 Transjel™

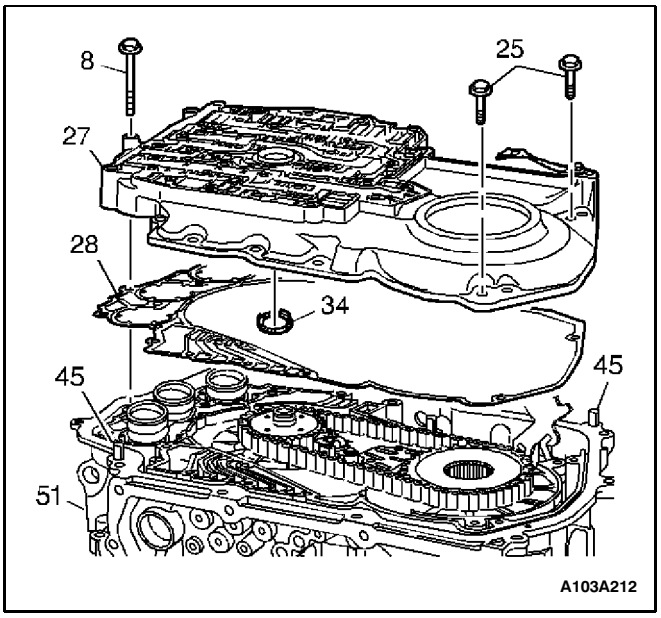
1. Assemble the new accumulator piston seals (30) on the three accumulator pistons (29).
2. Install the 1-2 and 2-3 accumulator assist springs (47 and 125).
3. Install the accumulator pistons (29) into the channel plate over the guide pins. The pistons are identical. You can assemble the pistons in any of the three accumulator bores.
4. In order to retain the pistons, apply J 36850 onto the piston seals.



ACCUMULATOR SPRINGS INSTALL

Important: The 1-2 accumulator spring (31) is slightly taller than the other two springs (32). Install a 1-2 accumulator spring in the bore closest to the electrical pass-through connector (11).

Install the two remaining accumulator springs into the transmission case accumulator bores.



CHANNEL PLATE ASSEMBLY INSTALLATION

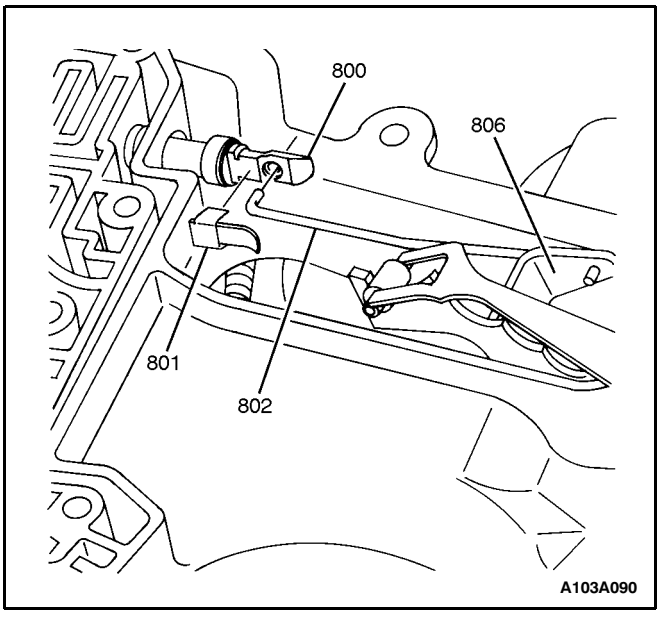
Tools Required

J 36850 Transjel™

1. **Install the channel plate to drive sprocket thrust washer (34) onto the channel plate (27).**
2. **Retain the thrust washer (34) with J 36850 or equivalent.**
3. **Install a new channel plate to case gasket (28) onto the transmission case (51).**
4. **Install the channel plate assembly onto the transmission case (51). The channel plate should fit tightly over the guide pins (45) located on the transmission case (51).**

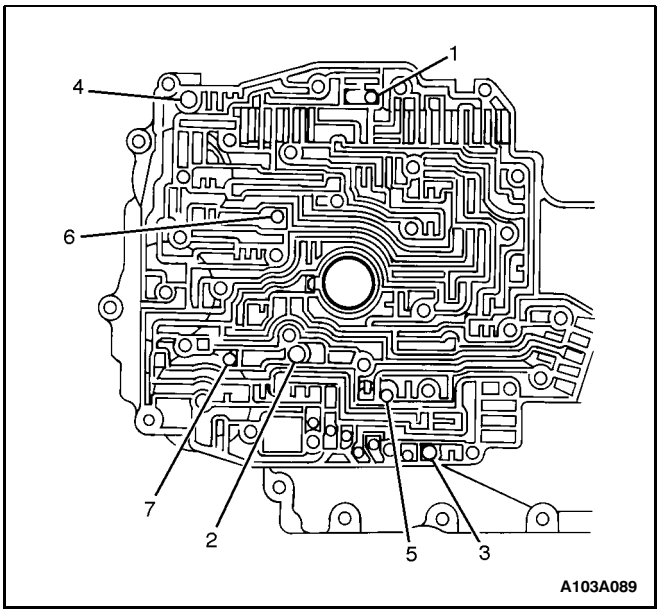
Important: Tighten the two channel plate bolts (25) to 14 N•m (10.5 lb-ft).

5. **Install the eight channel plate to case bolts (8 and 25) and the two channel plate to driven sprocket support bolts (25). Hand tighten the bolts and tighten to either 12 N•m (9 lb-ft) or 14 N•m (10.5 lb-ft).**



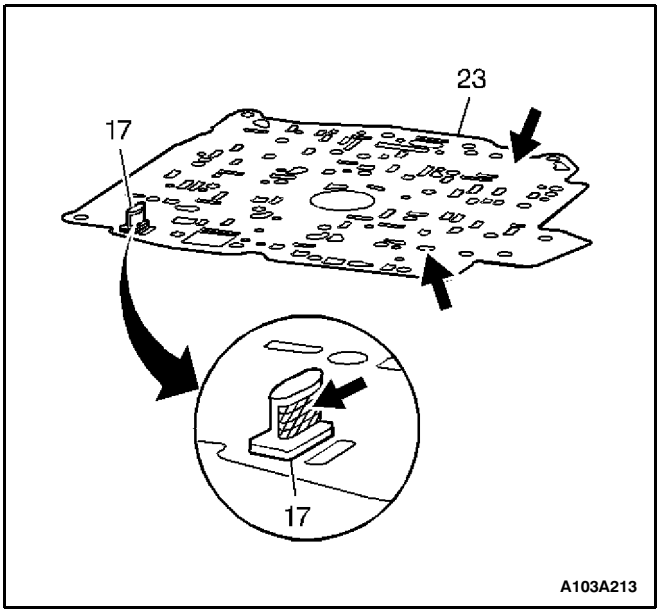
MANUAL VALVE INSTALL

1. **Install the manual valve (800) into the channel plate.**
2. **Connect the manual valve link (802) to both the manual valve and detent lever.**
3. **Install the manual valve clip (801) onto the manual valve.**



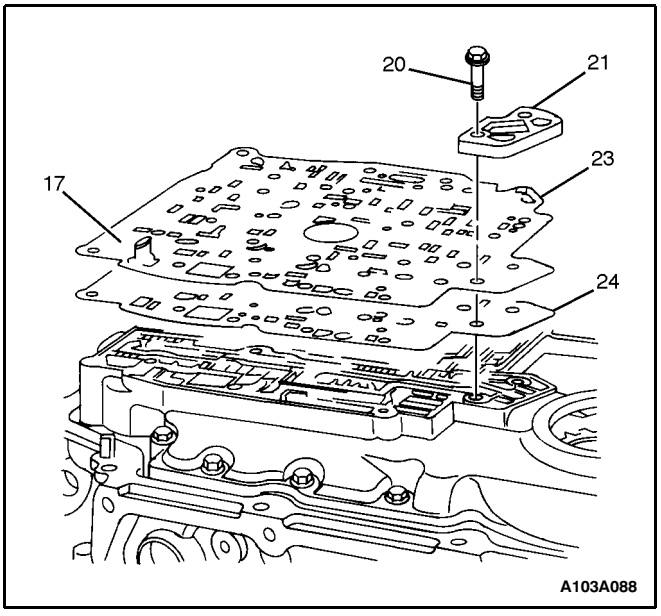
CHECKBALLS INSTALLATION

Install the seven checkballs into the proper locations on the channel plate.

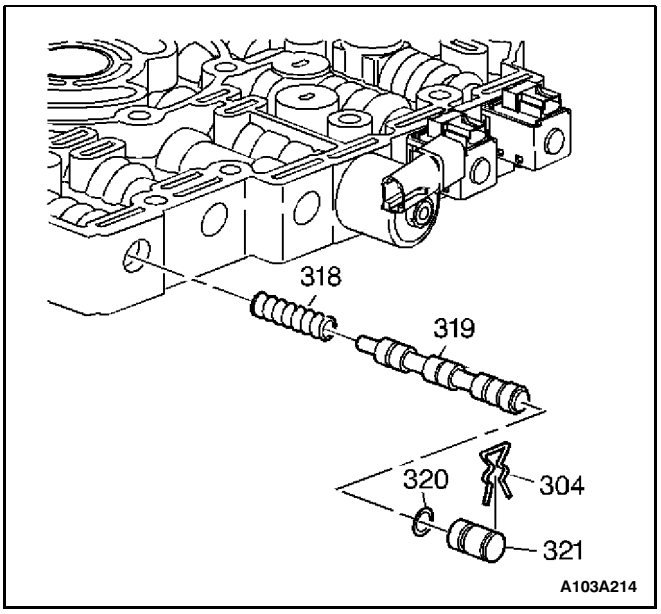


SPACER PLATE AND GASKETS INSTALL

1. **Inspect the spacer plate and spacer plate filter for damage.**
2. **If damaged, replace the spacer plate and spacer plate filter.**



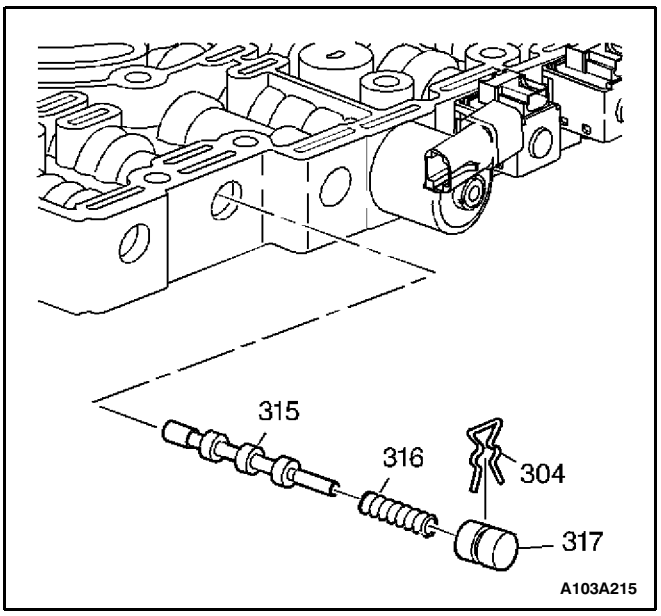
3. **Install a new spacer plate to channel plate gasket (24) onto the channel plate.**
4. **Install the spacer plate (23) on top of the gasket and channel plate.**
5. **Install the spacer plate support (21) and the two bolts (20) onto the spacer plate. Hand start and then tighten the bolts to 14 N•m (10.5 lb-ft).**



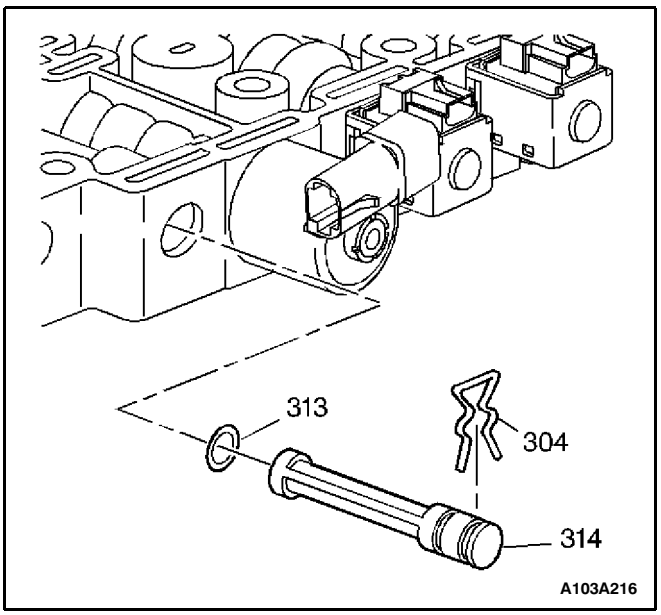
CONTROL VALVE BODY DISASSEMBLE

Important: Retainer clips hold in each of the valve line-ups. Use a small screwdriver in order to remove the retainer clips. Be careful not to score the valve body when removing the retainer clips and valves. Before removing the valve line-ups, inspect each valve line-up for freedom of movement.

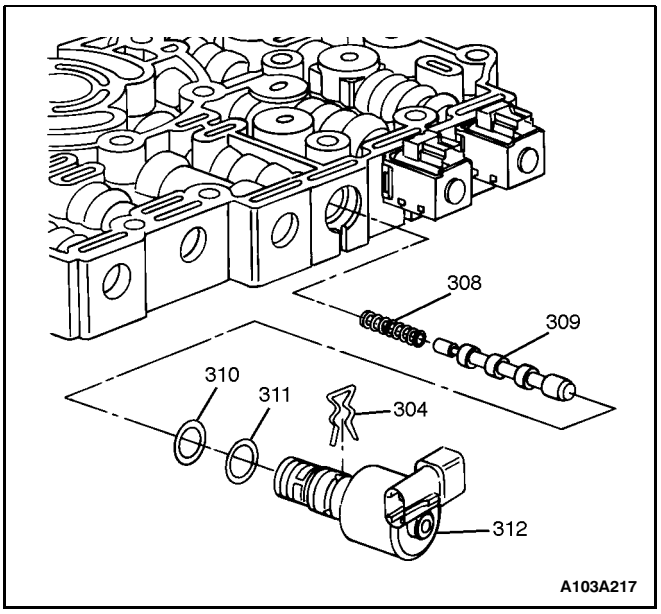
1. **Remove the 3-4 shift valve retainer clip (304), the bore plug (321), with O-ring (320), the 3-4 shift valve (319) and the 3-4 shift valve spring (318).**



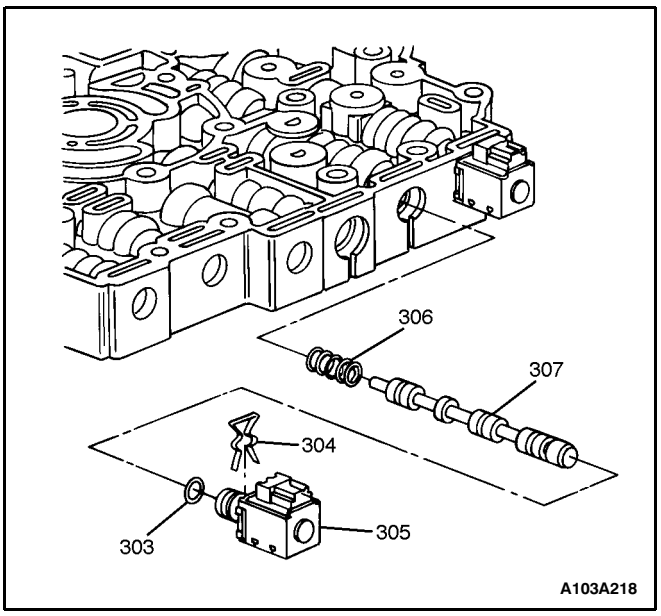
2. **Remove the actuator feed limit valve retainer clip (304), the bore plug (317), the actuator feed limit spring (316) and the actuator feed limit valve (315).**



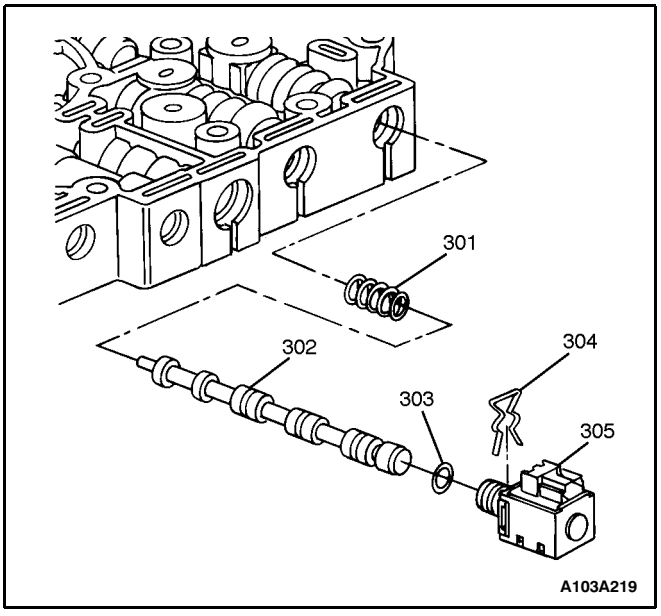
3. **Remove the actuator oil filter retainer clip (304) and the actuator oil filter (324) with O-ring (313).**



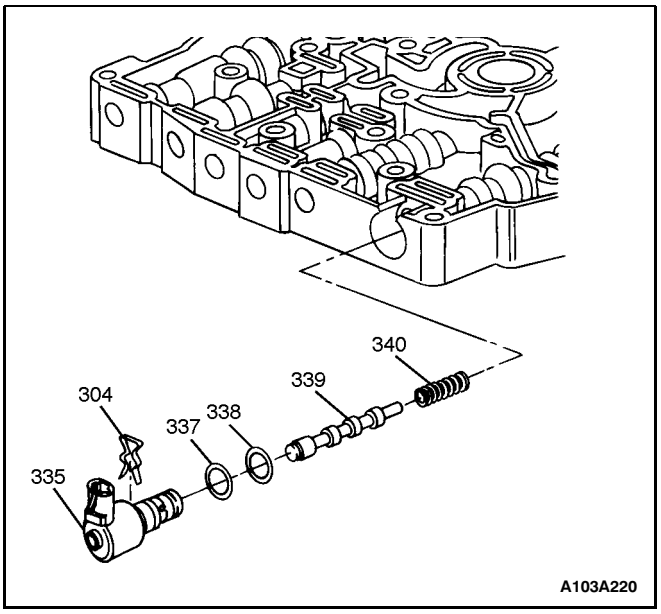
4. Remove the Pressure Control Solenoid (PCS) retainer clip (304), the PCS with two O-rings and screen (312, 309, and 310), the torque signal regulator valve (309), and the torque signal regulator spring (308).



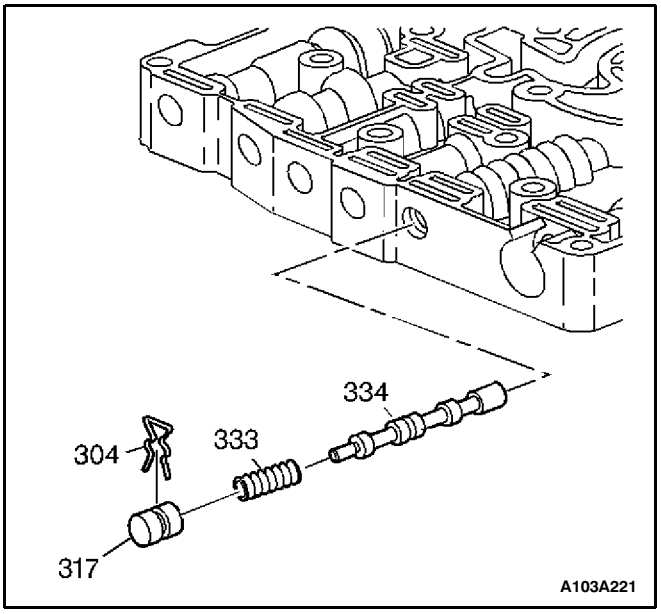
5. Remove the 2-3 shift solenoid retainer clip (304), the 2-3 shift solenoid (305) with O-ring (303), the 2-3 shift valve (307), and the 2-3 shift valve spring (306).



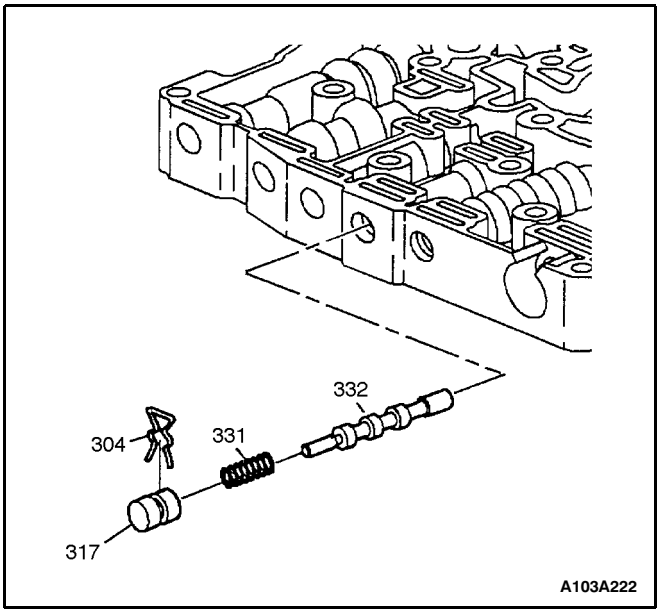
6. Remove the 1-2 shift solenoid retainer clip (304), the 1-2 shift solenoid (305) with O-ring (303), the 1-2 shift valve (302), and the 1-2 shift valve spring (301).



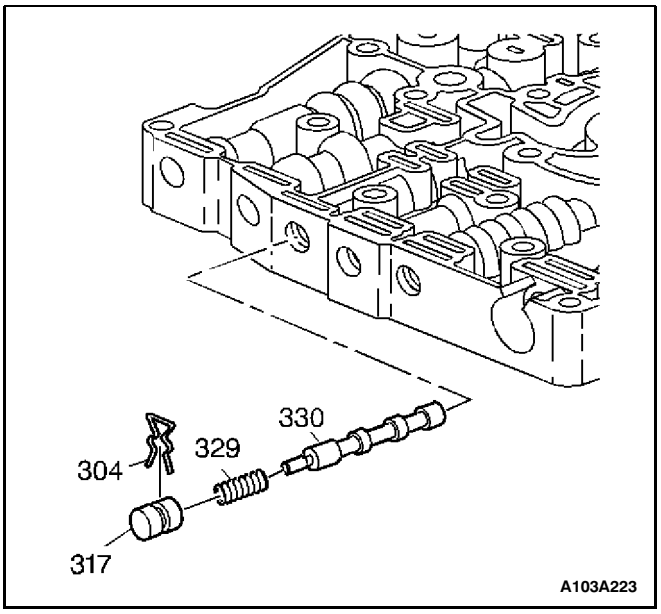
7. Remove the TCC solenoid retainer clip (304), the TCC solenoid (335) with two O-rings (337 and 338) and screen, the TCC regulated apply valve (339) and the spring (340).



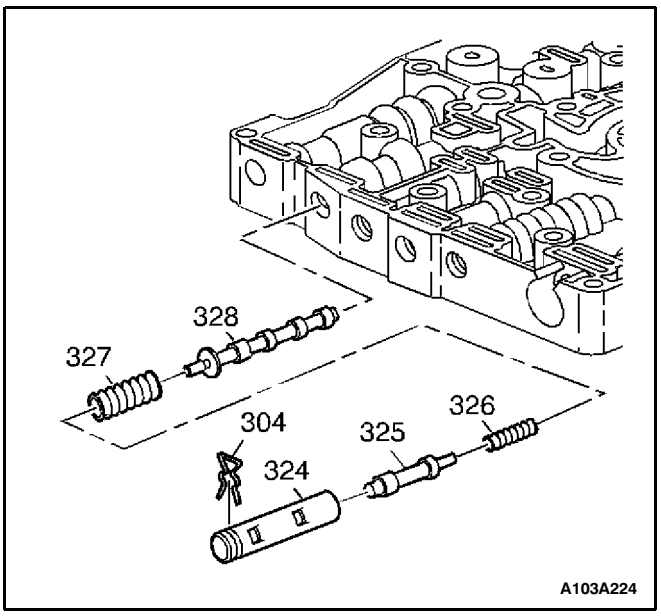
8. Remove the TCC control valve retainer clip (304), the bore plug (317), the spring (333), and the TCC control valve (334).



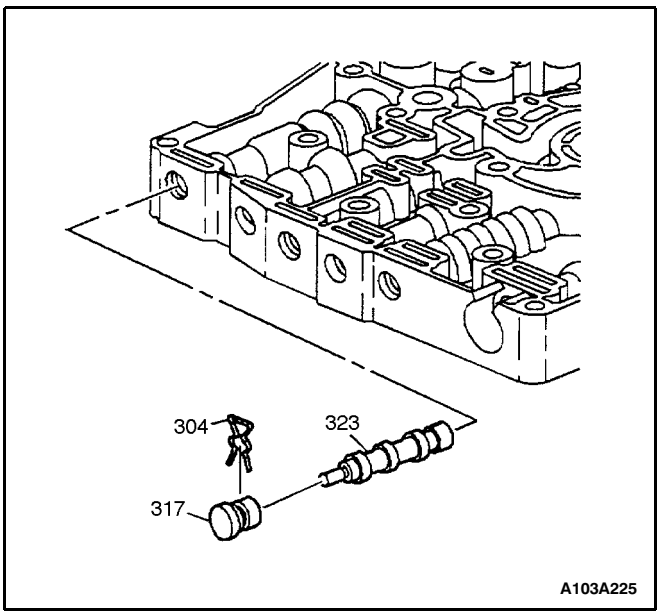
9. Remove the TCC feed limit valve retainer clip (304), the bore plug (317), the spring (331), and the TCC feed limit valve (332).



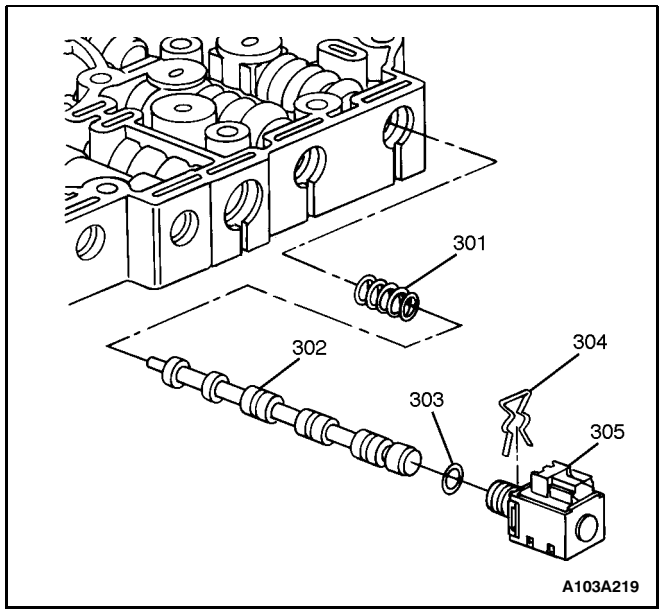
10. Remove the 2-3 accumulator valve retainer clip (304), the 2-3 accumulator valve bore plug (317), the 2-3 accumulator valve spring (329), and the 2-3 accumulator valve (330).



11. Remove the pressure regulator valve retainer clip (304), the bushing (324), the pressure regulator boost valve (325), the isolator spring (326), the pressure regulator valve spring (327), and the pressure regulator valve (328).

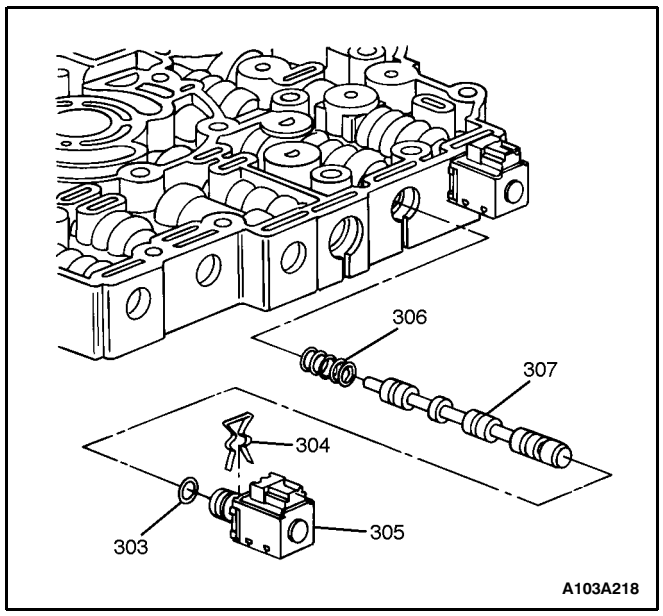


12. Remove the 1-2/3-4 accumulator valve retainer clip (304), the plug (317), and the accumulator valve (323).
13. Inspect the valve body passages for debris.
14. Inspect the machined surfaces for nicks or scratches. Some polish is normal for the machined surfaces.
15. Inspect the valves for nicks or scratches that could cause sticking valves or fluid leaks.
16. Inspect the springs, bushings, O-rings, screens and solenoids for damage.
17. Clean and dry the valve body and valve body components.

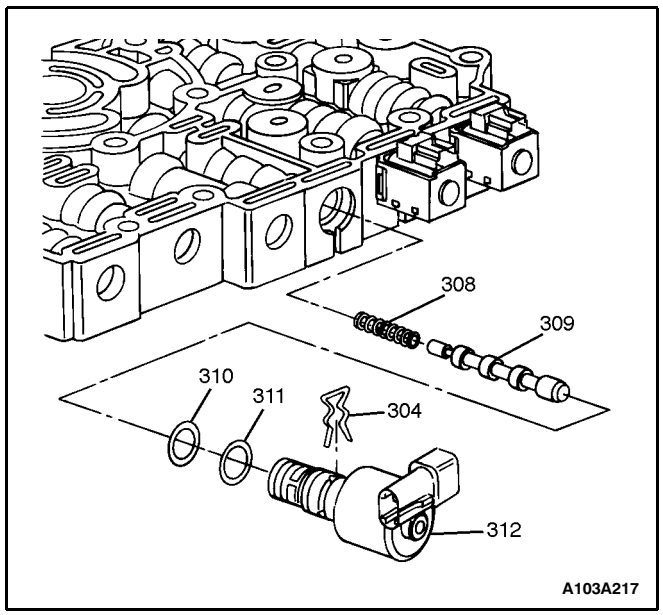


CONTROL VALVE BODY ASSEMBLE

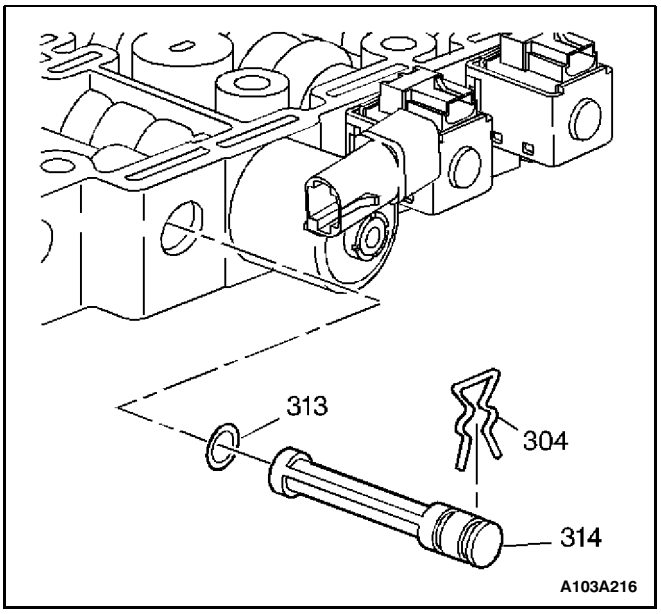
1. Install the 1-2 shift valve spring (301), the 1-2 shift valve (302), the 1-2 shift solenoid (305) with O-ring (303), and the 1-2 shift solenoid retainer clip (304).



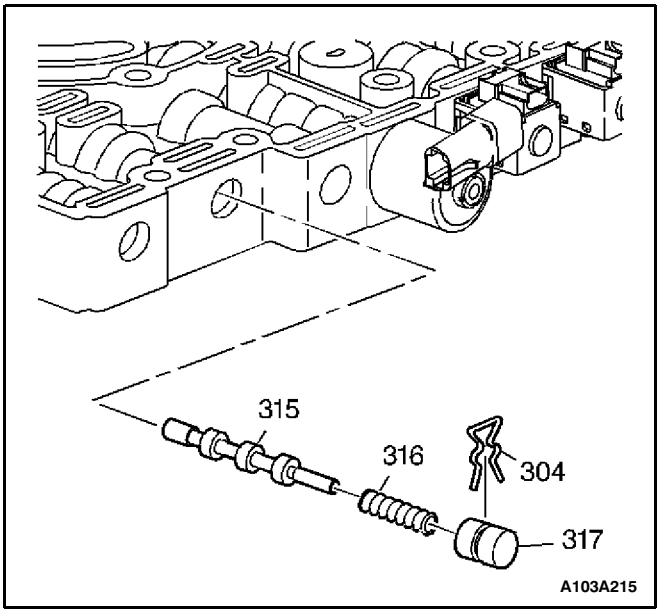
2. Install the 2-3 shift valve spring (306), the 2-3 shift valve (307), the 2-3 shift solenoid (305) with O-ring (303), and the 2-3 shift solenoid retainer clip (304).



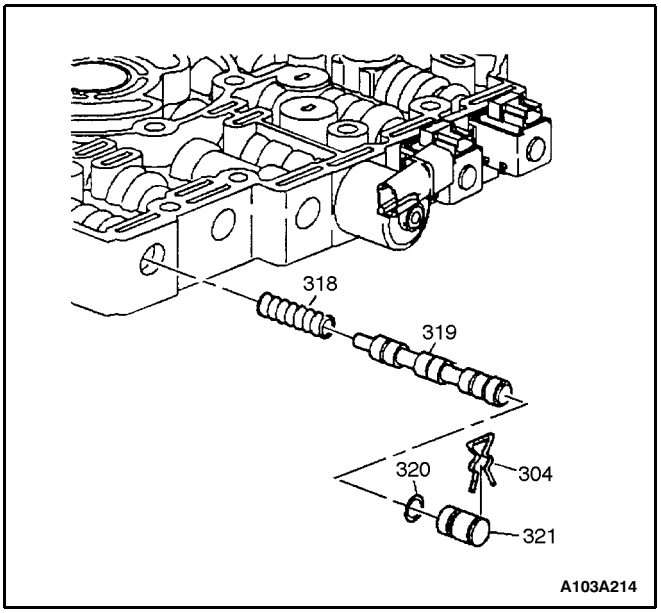
3. Install the torque signal regulator spring (308), the torque signal regulator valve (309), the Pressure Control Solenoid (PCS) with two O-rings and screen (312, 309 and 310), and the PCS retainer clip (304).



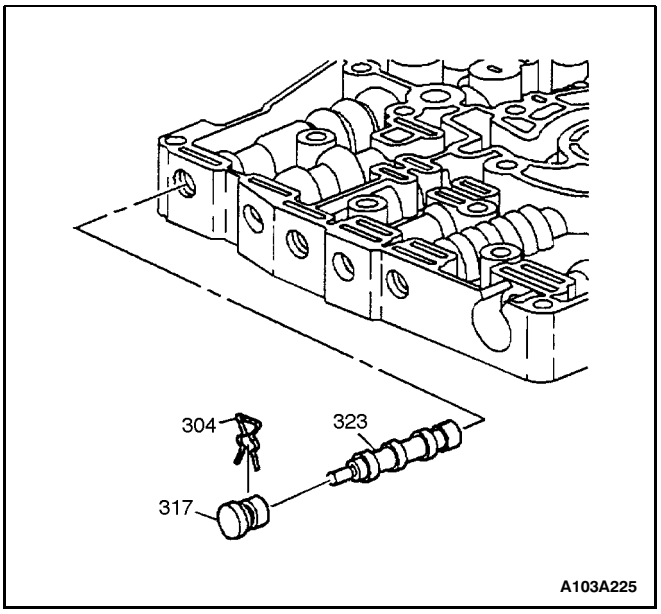
4. **Install the actuator oil filter (324) with the O-ring (313) and the actuator oil filter retainer clip (304).**



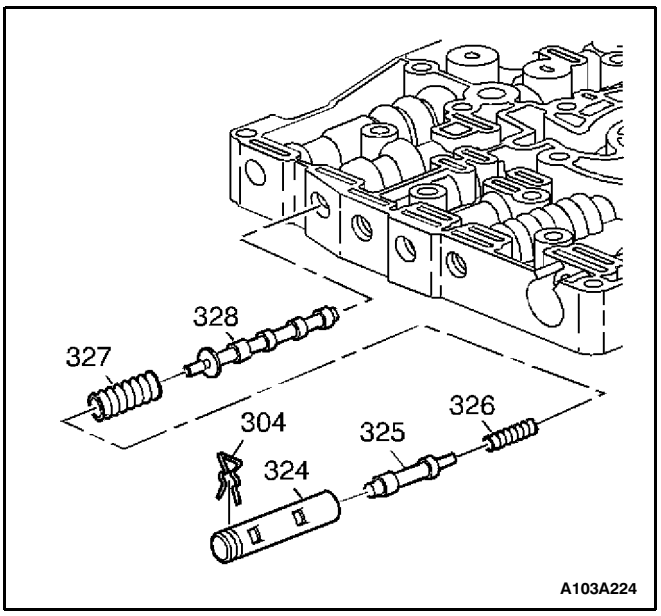
5. **Install the actuator feed limit valve (315), the actuator feed limit spring (316), the bore plug (317), and the actuator feed limit valve retainer clip (304).**



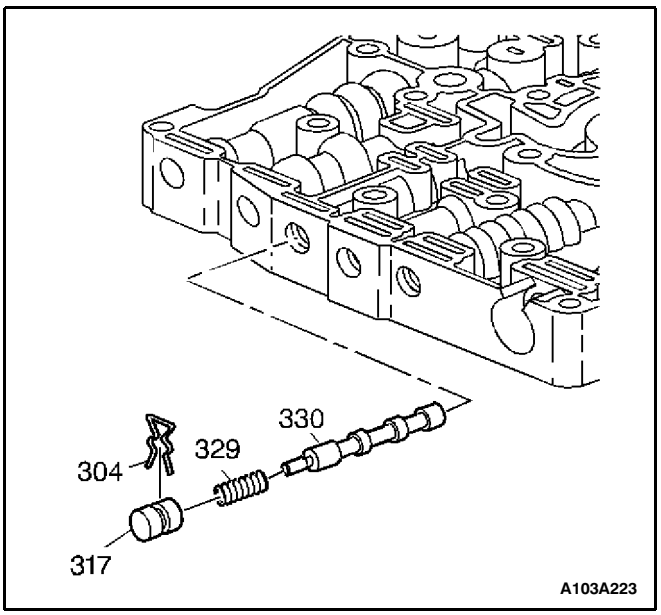
6. **Install the 3-4 shift valve spring (318), the 3-4 shift valve (319), the bore plug (321), with O-ring (320), and the 3-4 shift valve retainer clip (304).**



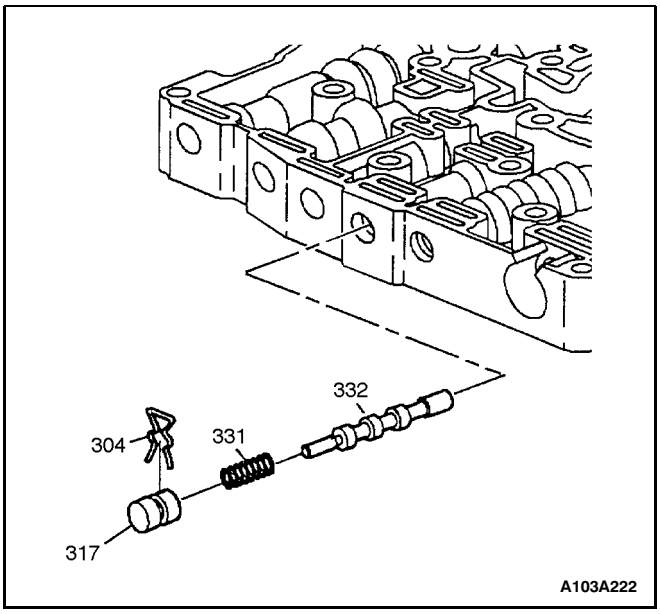
7. Install the accumulator valve (323), the plug (317), and the 1-2/3-4 accumulator valve retainer clip (304).



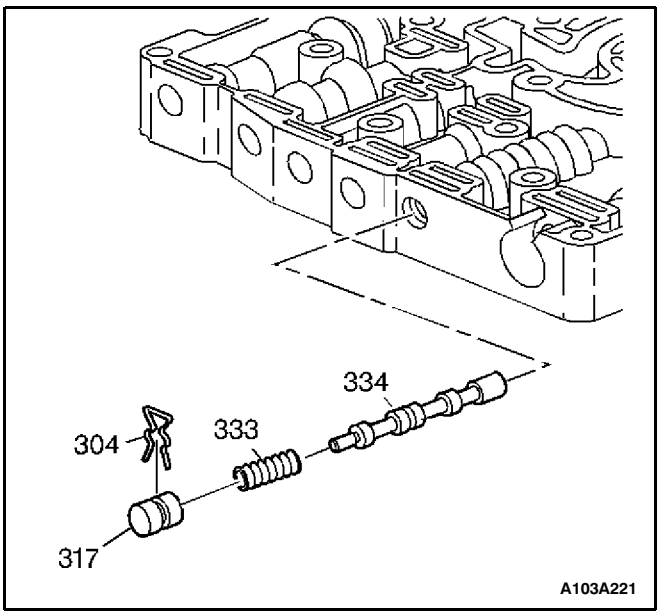
8. Install the pressure regulator valve (328), the pressure regulator valve spring (327), the isolator spring (326), the pressure regulator boost valve (325), the bushing (324), and the pressure regulator valve retainer clip (304).



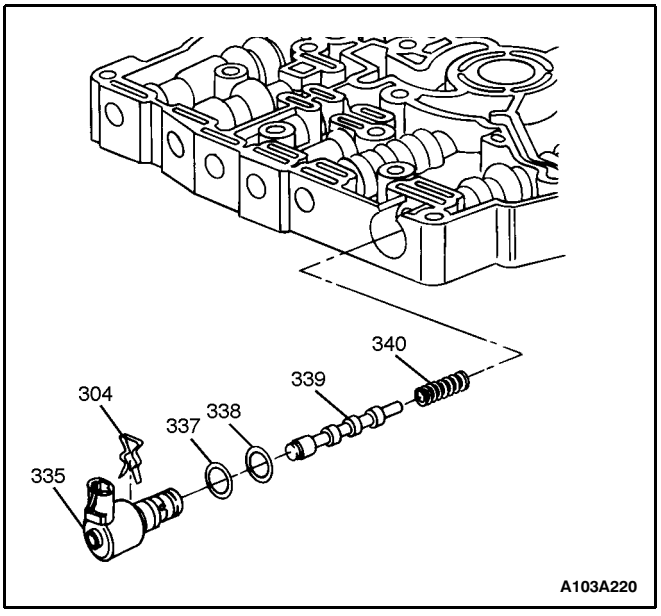
9. Install the 2-3 accumulator valve (330), the 2-3 accumulator valve spring (329), the 2-3 accumulator valve bore plug (317), and the 2-3 accumulator valve retainer clip (304).



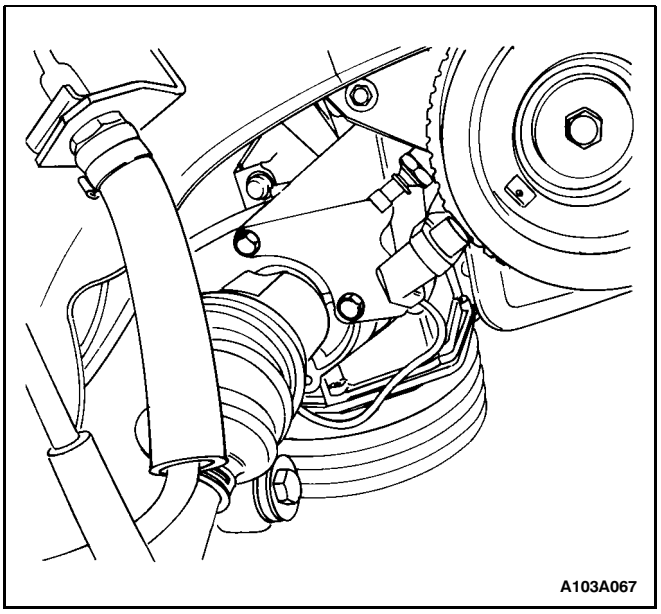
10. Install the TCC feed limit valve (332), the spring (331), the bore plug (317), and the TCC feed limit valve retainer clip (304).



11. Install the TCC control valve (334), the spring (333), the bore plug (317), and the TCC control valve retainer clip (304).

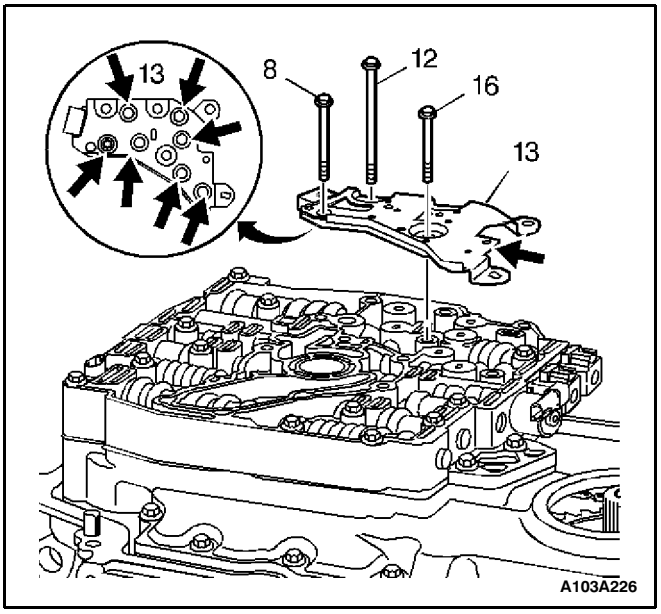


12. Install the spring (340), the TCC regulated apply valve (339), the TCC solenoid (335) with two O-rings (337 and 338) and screen, and the TCC solenoid retainer clip (304).


A103A067

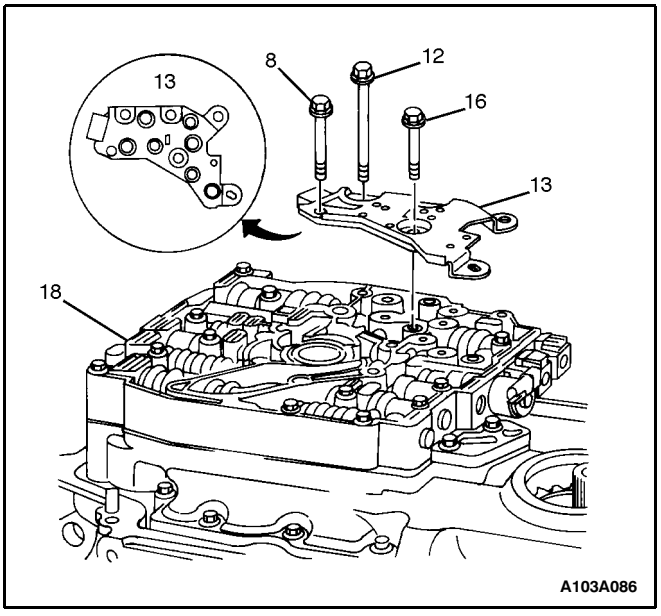
CONTROL VALVE ASSEMBLY AND TFP SWITCH INSTALL

1. Install the control valve body assembly to spacer plate gasket (22) onto the spacer plate (23).
2. Install the control valve body assembly (18) onto the transmission.



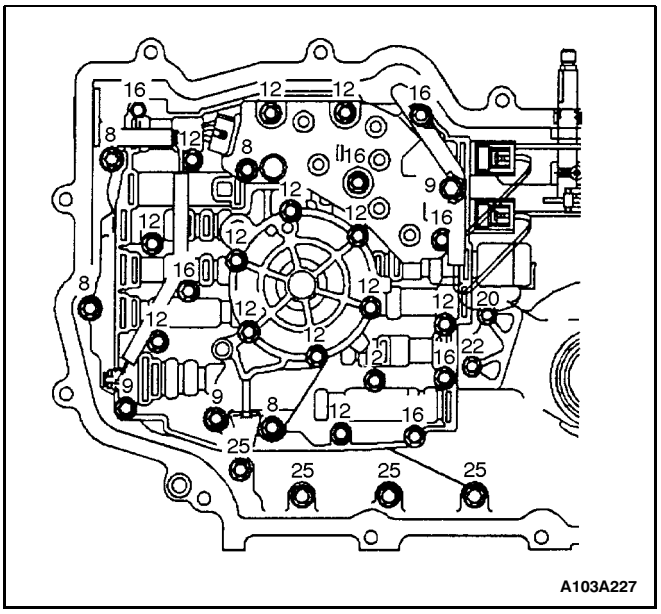
A103A226

3. Inspect the TFP switch (13) in order to verify the condition and correct location of the seven pressure switch O-rings.
4. If necessary, replace the pressure switch O-rings.



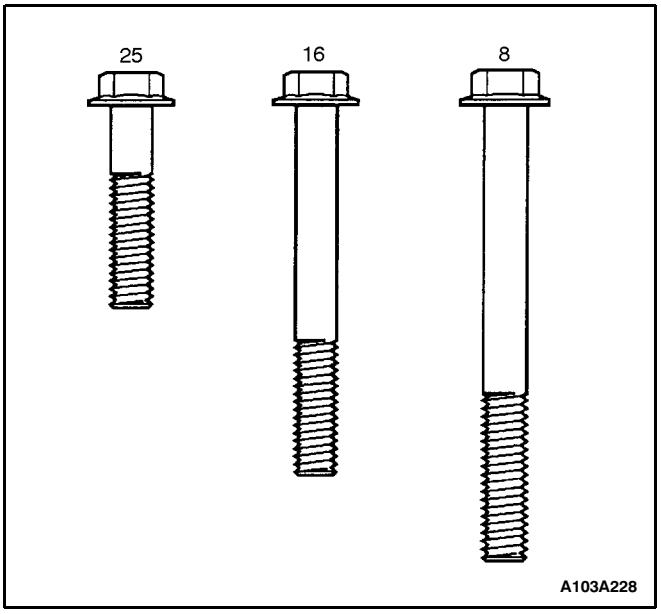
A103A086

5. Install the TFP switch (13) onto the control valve assembly.



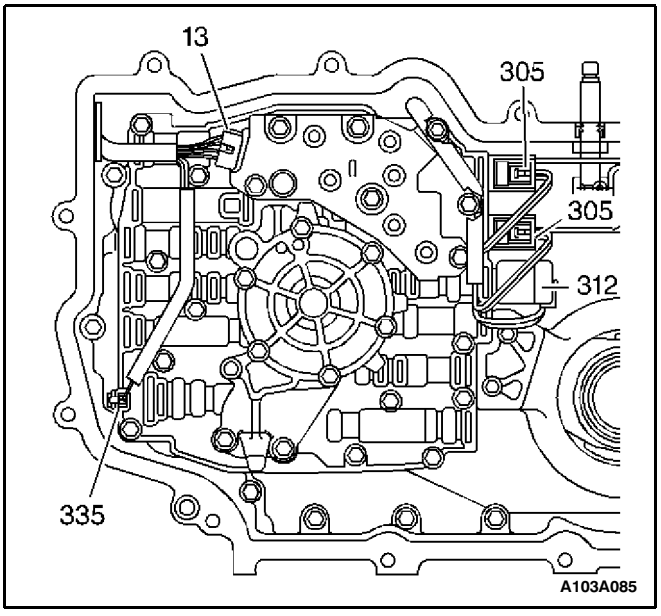
A103A227

6. Install the eighteen control valve assembly bolts.



A103A228

7. Hand start the bolts, then tighten the bolts to 12 N•m (9 lb-ft).



A103A085

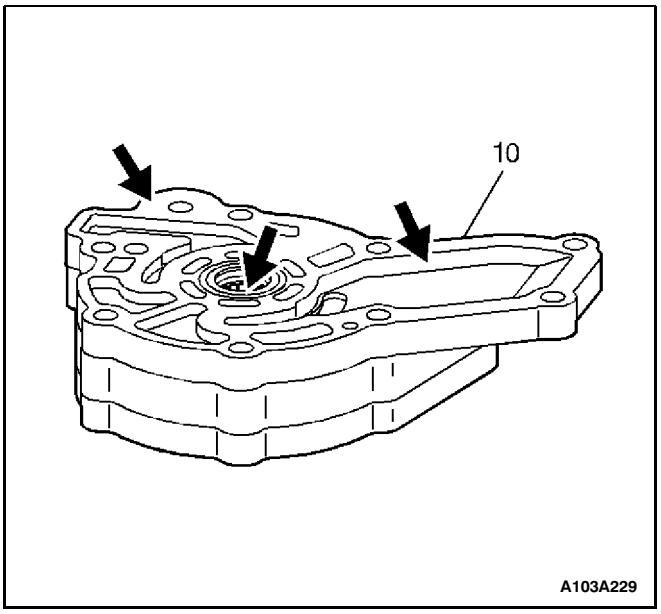
WIRING HARNESS ASSEMBLY CONNECT

Connect the wiring harness assembly to the following components:

- The TFP switch (13)
- The pressure control solenoid (312) (red connector)

Important: The 1-2 shift solenoid wires are red and light green. The 2-3 shift solenoid wires are red and yellow.

- The 1-2 shift solenoid (305) (white connector)
- The 2-3 shift solenoids (305) (white connectors)
- The TCC solenoid (335)

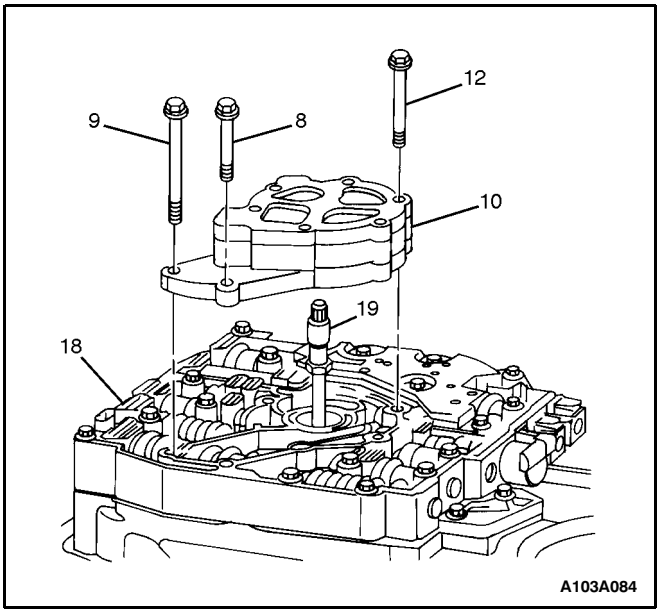


OIL PUMP CLEAN AND INSPECT

1. Inspect the bearing on the flange for excessive wear or damage.
2. Inspect the machined surfaces for scratches or nicks that may cause a fluid leak.

Important: While flushing, rotate the oil pump rotor with the oil pump drive shaft. Rotating the oil pump rotor flushes clean fluid through the oil pump.

3. Thoroughly flush the oil pump with clean transmission fluid through the pump inlet and outlet passages.
4. Drain excess fluid from the oil pump assembly.

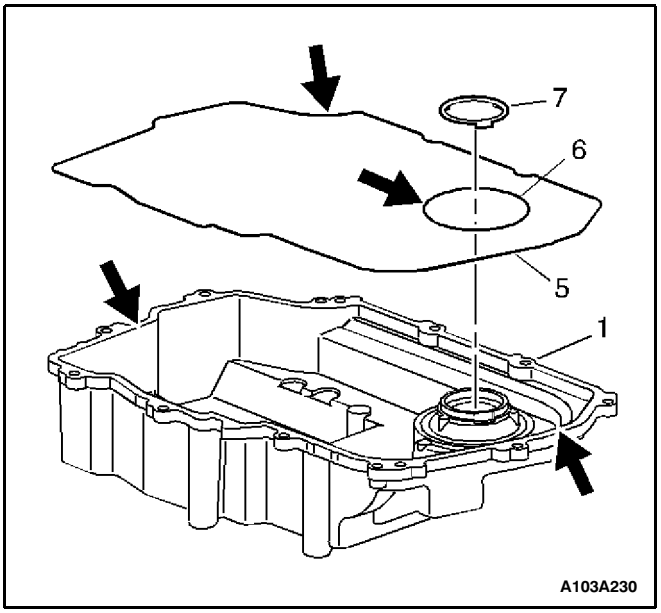


OIL PUMP ASSEMBLY INSTALLATION

1. Install the oil pump shaft (19) into the control valve body assembly (18).

Important: If necessary, rotate the oil pump shaft while installing the oil pump assembly in order to engage the shaft splines to the splines on the pump rotor.

2. Install oil pump assembly (10) onto the oil pump shaft (19) and control valve body (20).
3. Install the eight oil pump bolts (8, 9 and 12). Hand start the bolts, then tighten the bolts to 12 N•m (9 lb-ft.)

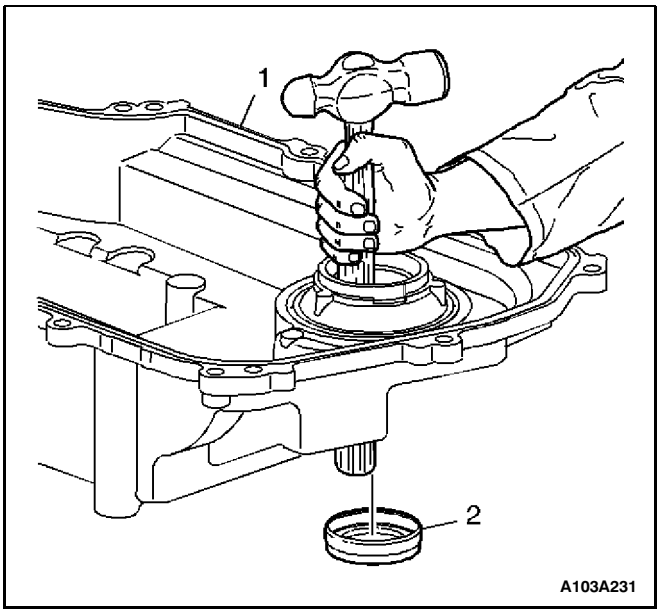


SIDE COVER/GASKETS, DISASSEMBLE, ASSEMBLE, INSTALL

Tools Required

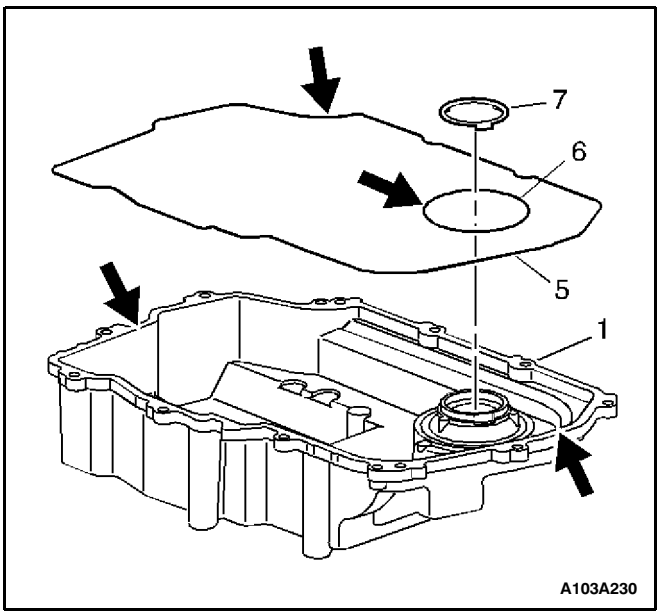
J 36850 Transjel™

1. Remove the side cover gaskets (5 and 6) and the thrust washer (17) from the side cover (1).

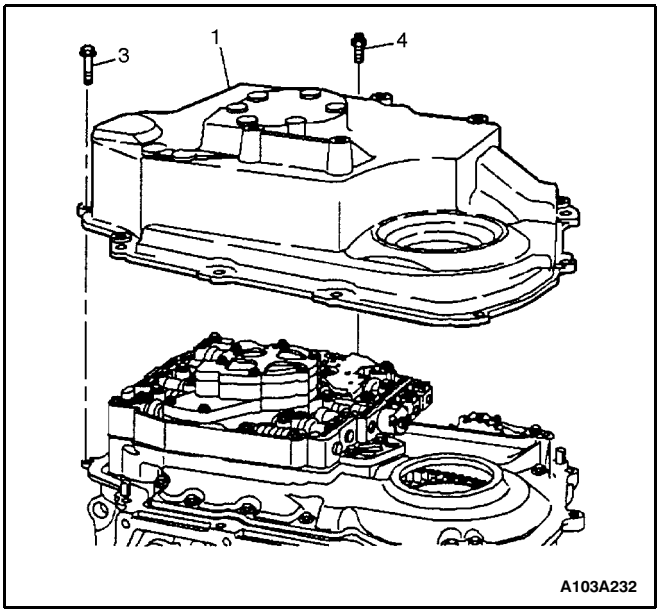


Important: Do not score or damage the side cover bore.

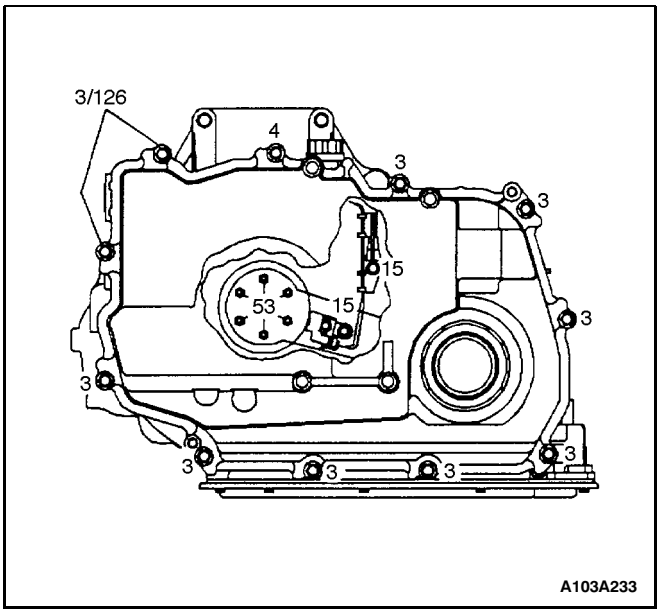
2. **Remove the side cover axle seal. Use the handle end of a hammer.**



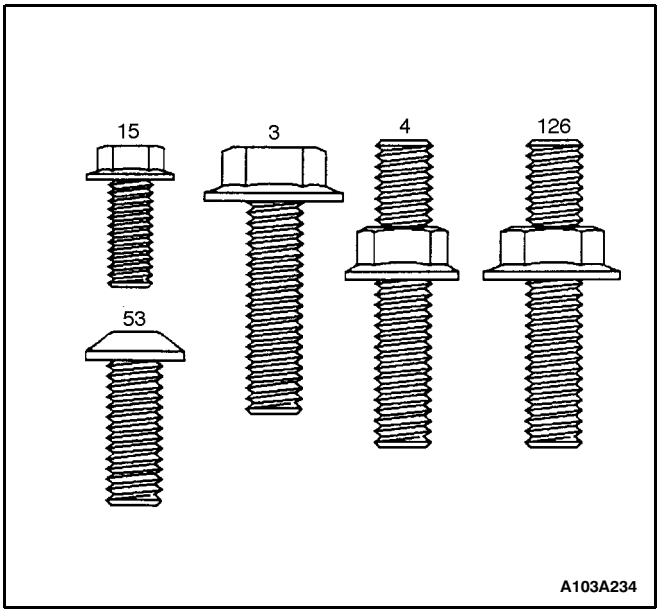
3. **Inspect the side cover for cracks or damage to the seal grooves and mounting bosses.**
4. **Inspect the side cover seals for damage. The side cover seals are reusable if not damaged.**
5. **Thoroughly clean the side cover and the side cover seals.**
6. **Clean and dry the seal grooves and the axle seal bore.**
7. **Install the side cover gaskets (5 and 6) into the grooves on the side cover (1).**
8. **Retain the seals with J 36850 or equivalent.**
9. **Install the side cover to drive sprocket thrust washer (7) onto the side cover.**
10. **Retain the thrust washer with J 36850 or equivalent.**



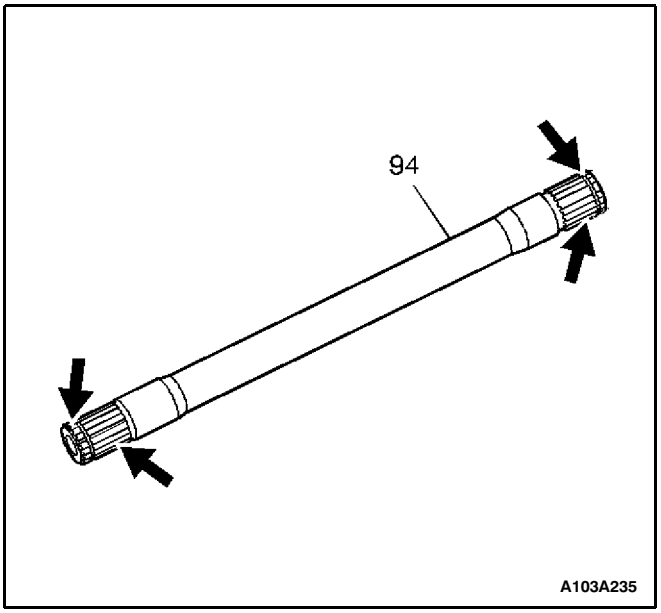
11. **Install the side cover assembly onto the transmission case (51).**
12. **Install the 11 side cover bolts (3) and one stud (4).**



13. Refer to the graphic in order to find the correct installation points of the bolts and the stud.



14. Hand start and then tighten the side cover bolts and stud to 20 N•m (15 lb-ft).

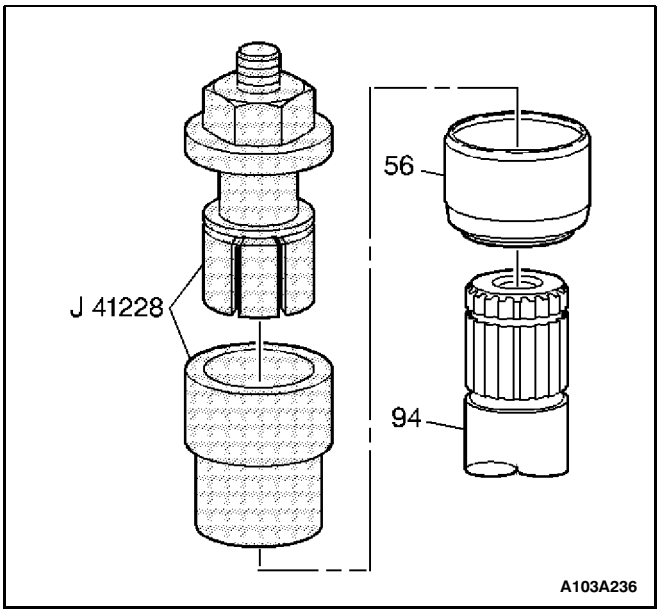


OUTPUT SHAFT SLEEVE ASSEMBLE

Tools Required

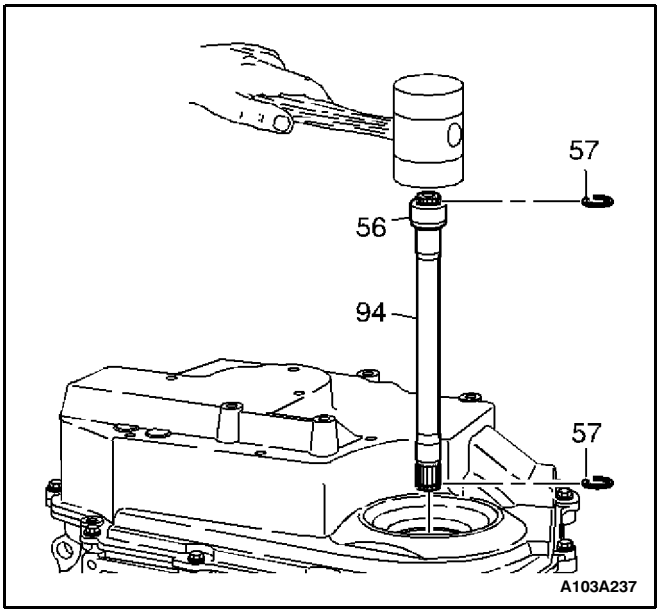
J 41228 Output Shaft Sleeve Installer

1. Inspect the output shaft (94) for damage to the splines, snap ring grooves and the journals.
2. Clean and dry the output shaft.



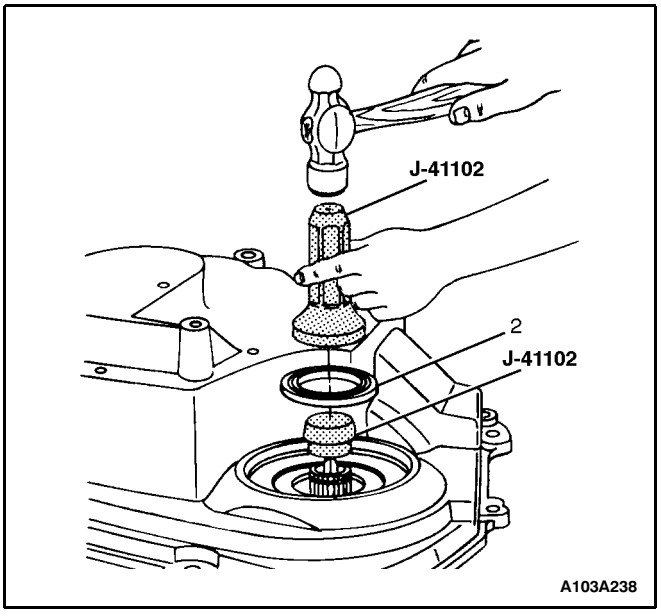
Important: You must use the J 41228 in order to install the sleeve onto the output and stub shafts. If you do not use the J 41228, you will cause a fluid leak.

3. **Place a sleeve (56) over the end of the output shaft (94).**
4. **Install the collet into the output shaft snap ring groove with the collet attached to the threaded collet shaft.**
5. **Place the sleeve installing tube over the collet. Be sure the small outside diameter of the tube fits securely into the sleeve.**
6. **Install the bearing and nut onto the threaded collet shaft.**
7. **In order to move the installing tube and press the sleeve onto the output shaft, hold the end of the threaded collet shaft while tightening the nut down.**
8. **Remove the J 41228.**



OUTPUT SHAFT AND SLEEVE ASSEMBLY INSTALL

1. **Install the two new snap rings (57) into the output shaft (94) snap ring grooves.**
2. **Install the output shaft and sleeve assembly (94 and 56) into the transmission case. Use a mallet in order to install the shaft (94) through the final drive differential gear.**



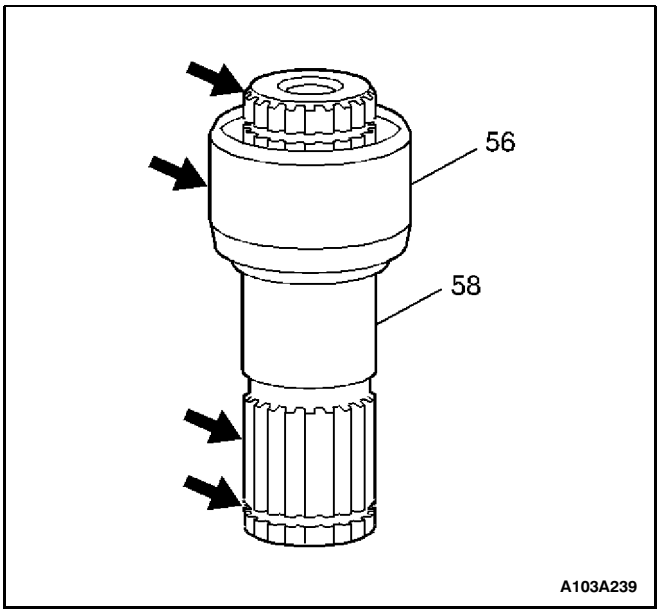
SIDE COVER AXLE SEAL INSTALL

Tools Required

J 41102 Axle Seal Installer

Important: You must use the J 41102 in order to install the seal correctly. The J 41102 installs the axle seal to a given depth.

1. **Install a new side cover axle seal (2) into the side cover. Use the J 41102.**
2. **In order to prevent damage to the shaft splines during vehicle operation, add Polyurea grease (part number 7843867) to the splines on the output shaft.**

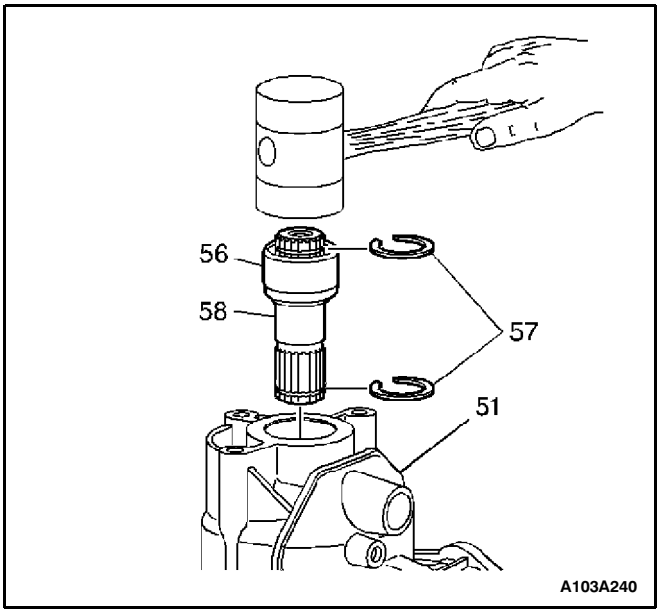


STUB SHAFT SLEEVE ASSEMBLE AND INSTALL

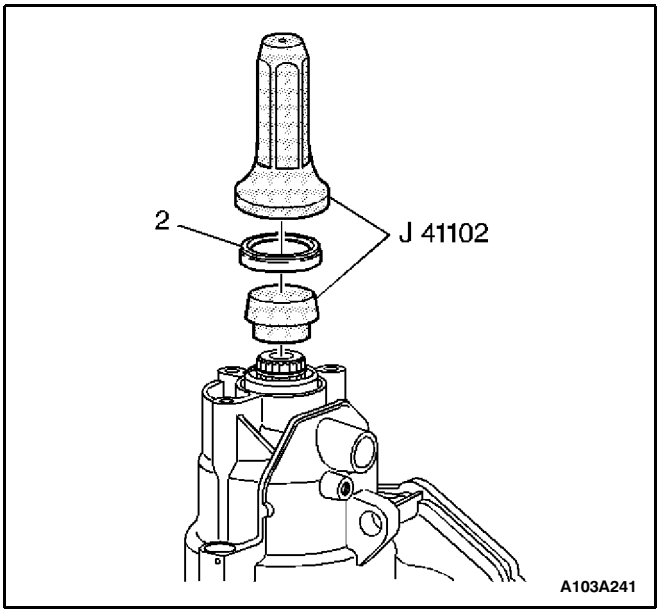
1. Inspect the stub shaft (58) for damage to the splines, the snap ring grooves, and the journals.

Important: If the sleeve (56 appears damaged, replace the sleeve (56) using the same procedure for removal and installation as with the output shaft sleeve. Refer to Output Shaft and Sleeve Assembly Install.

2. Inspect the sleeve (56) for excessive wear, scratches or nicks that could cause a leak or damage the seal portion.
3. Clean and dry the stub shaft and sleeve assembly.



4. Install the two new snap rings (57) on the stub shaft (58). The snap rings (57) are not reusable after you remove the shaft (58).
5. Install the stub shaft into the transmission. Use a mallet in order to install the shaft through the final drive differential gear.



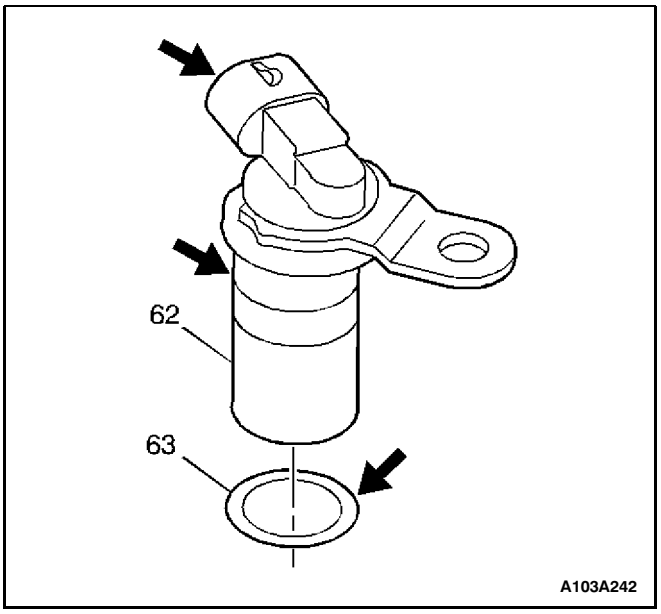
RIGHT HAND AXLE SEAL ASSEMBLE

Tools Required

J 41102 Axle Seal Installer

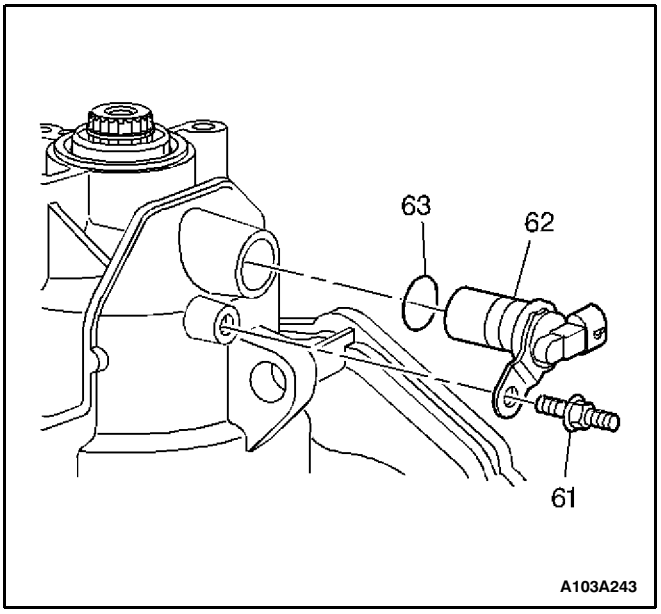
Important: You must use the J 41102 in order to install the seal correctly. The J 41102 installs the axle seal to a given depth.

1. Install a new right hand axle seal (2) into the transmission case. Use the J 41102.
2. In order to prevent damage to the shaft splines during vehicle operation, add Polyurea grease (part number (7843867) to the splines on the output shaft.

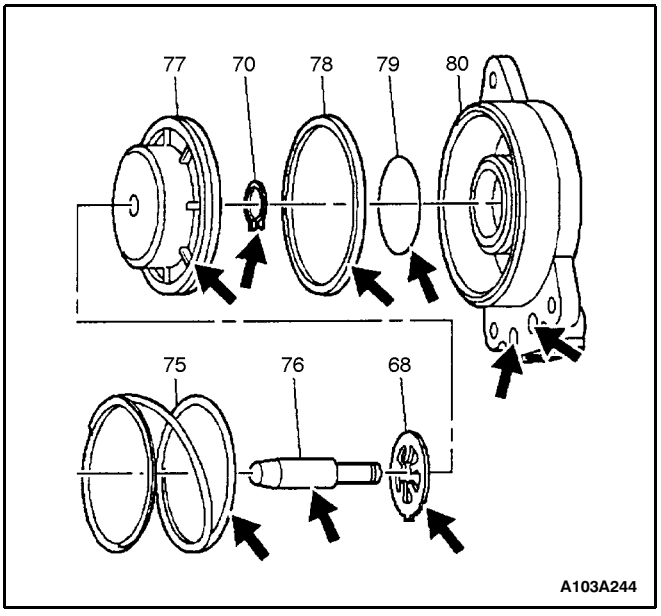


OUTPUT SPEED SENSOR INSTALLATION

1. Inspect the output speed sensor (62) for damage to the sensor, the electrical connector, or the O-ring (63).
2. Clean and dry the output speed sensor (62).

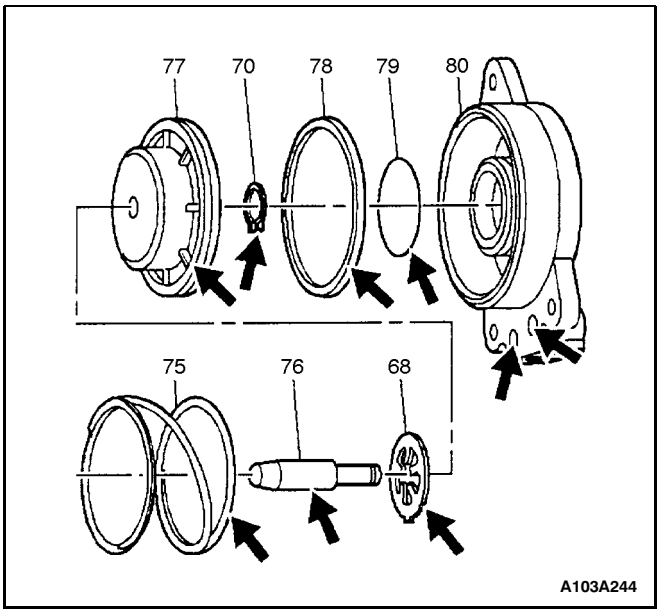


3. Install the O-ring (63) onto the output speed sensor (62).
4. Install the output speed sensor (62) into the transmission case.
5. Install the output speed sensor stud (61). Tighten the speed sensor stud to 12 N•m (9 lb-ft).

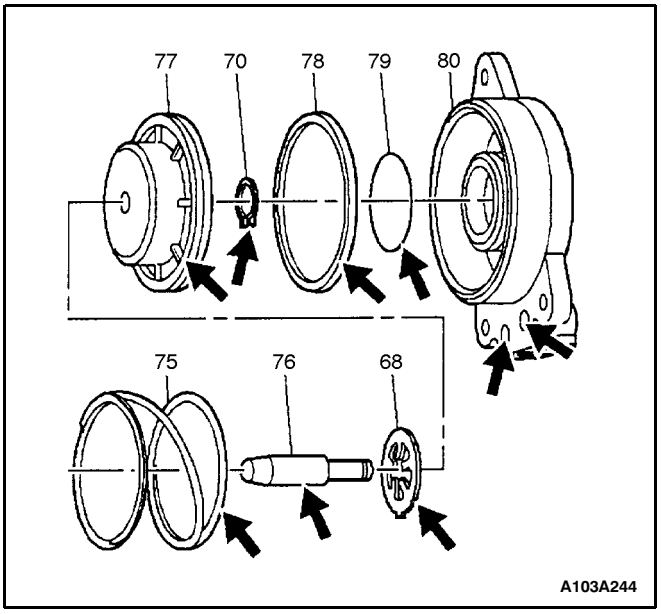


INTER 4TH SERVO DISASSEMBLE, ASSEMBLE, AND INSTALL

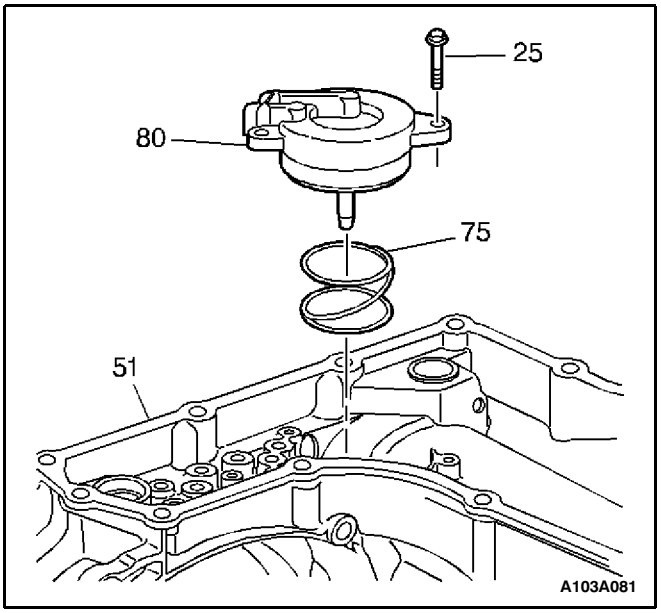
1. Remove the piston and pin assembly (76 and 77) from the servo cover (80).
2. Remove the snap ring (70) from the servo pin (76).
3. Remove the piston (77) and servo cushion springs (68) from the servo pin (76).
4. Remove the outer (78) and inner (79) servo piston seal from the cover (80).
5. Discard the outer and inner servo piston seals. Do not reuse the servo piston seals.



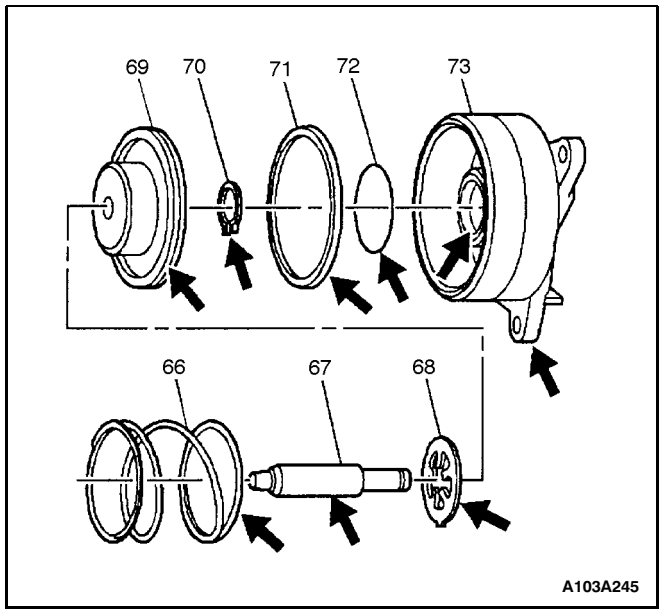
6. Inspect all components for damage.
7. Inspect the fluid feed holes for proper opening.
8. Inspect the bolt hole threads for debris and stripping.
9. Inspect the seal grooves for damage.
10. Clean and dry each component.



11. Install the servo cushion springs (68) and the servo piston (77) onto the servo pin (76).
12. Install the snap ring (70) onto the servo pin (76) in order to retain the springs (68) and piston (77).
13. Install the new seals (78 and 79) onto the servo piston (77) and servo cover (80).
14. Install the servo piston assembly into the servo cover (80). Lubricate the piston seals with transmission fluid in order to aid in assembly.

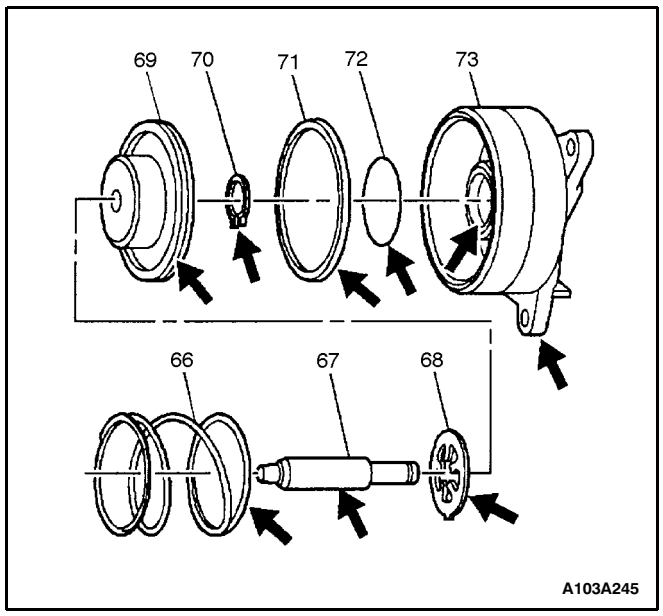


15. Install the servo return spring (75) onto the transmission case (51).
16. Install the servo cover (80) and the piston assembly over the servo return spring (75).
17. Install the three servo cover bolts (25). Hand start the bolts and then tighten the bolts to 12 N•m (9 lb-ft).



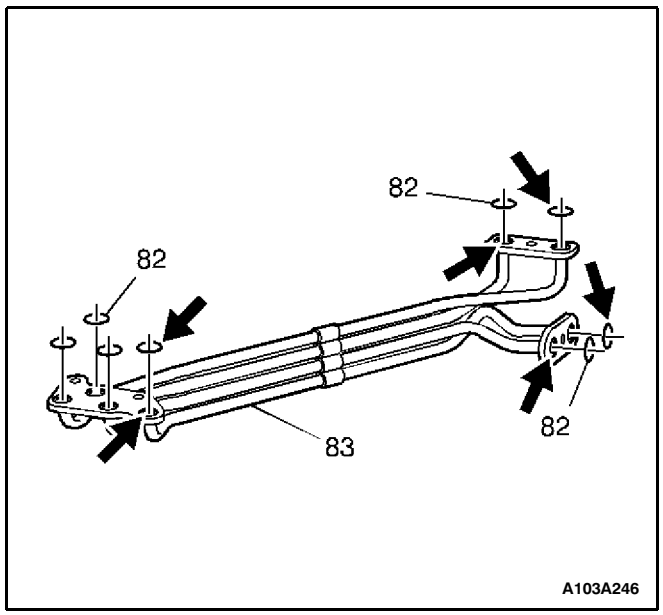
LOW/REVERSE SERVO DISASSEMBLE

1. Remove the piston pin assembly (67-70) from the servo cover (73).
2. Remove the snap ring (70) from the servo pin (67).
3. Remove the piston (69) and the servo cushion springs (68) from the servo pin (67).
4. Remove the servo piston seals (71 and 72) from the cover (73).
5. Discard the servo piston seals (71 and 72).
6. Inspect all the components for damage.
7. Inspect the fluid feed holes for the proper opening.
8. Inspect the bolt hole threads for debris or stripping.
9. Inspect the seal grooves for damage.
10. Clean and dry each component.



LOW/REVERSE SERVO ASSEMBLE, INSTALL

1. Assemble the servo cushion springs (68) and servo piston (69) onto the servo pin (67).
2. Install the snap ring onto the servo pin (67) in order to retain the servo cushion springs (68) and the servo piston (69).
3. Assemble the new seals (71, 72) onto the servo piston (69) and the servo cover (73).
4. Assemble the servo piston assembly (67-70) into the servo cover (73). Lubricate the piston seals with transmission fluid in order to aid in assembly.



OIL FEED PIPES ASSEMBLE

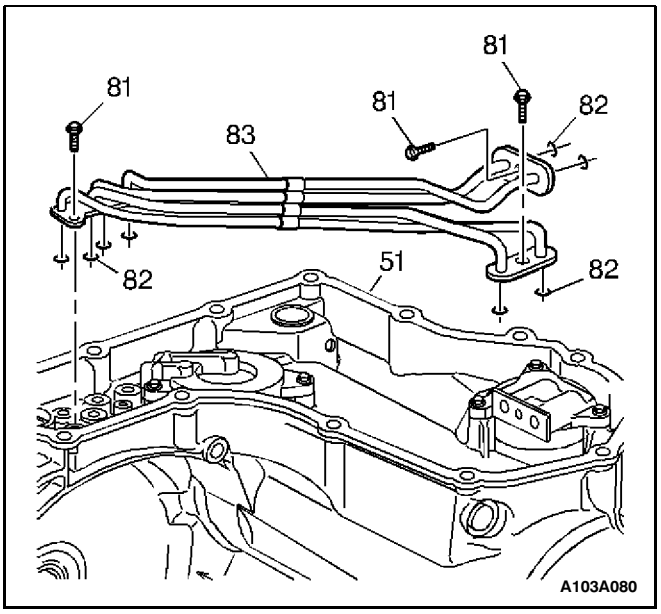
Tools Required

J 36850 Transjel™

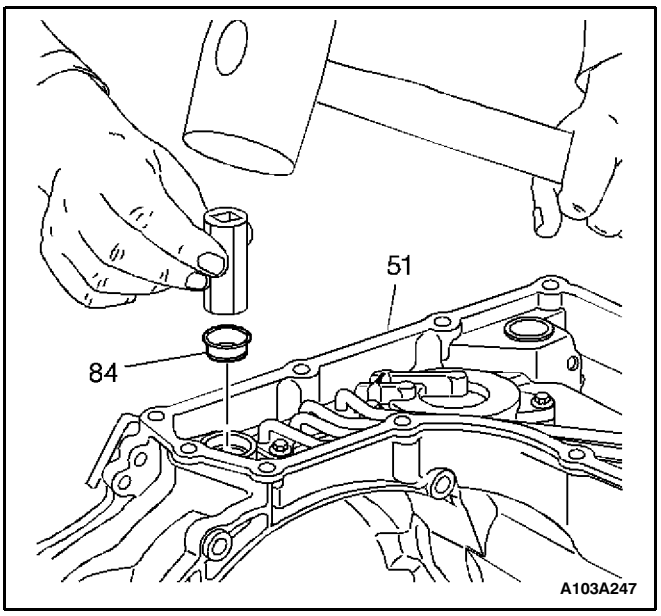
1. Inspect the oil feed pipes (83) for plugged passages, bent pipes, or cracks.
2. Inspect the oil feed pipe seal rings (82) in order to verify the proper location of the seal rings (82).

Important: The oil feed pipe seals are glued into place during initial assembly. If you must replace a seal ring, be sure to thoroughly clean any residual glue from the oil feed pipes.

3. Replace the seal rings (82) only if they are cut, swelled or damaged.
4. Clean and dry the oil feed pipes.



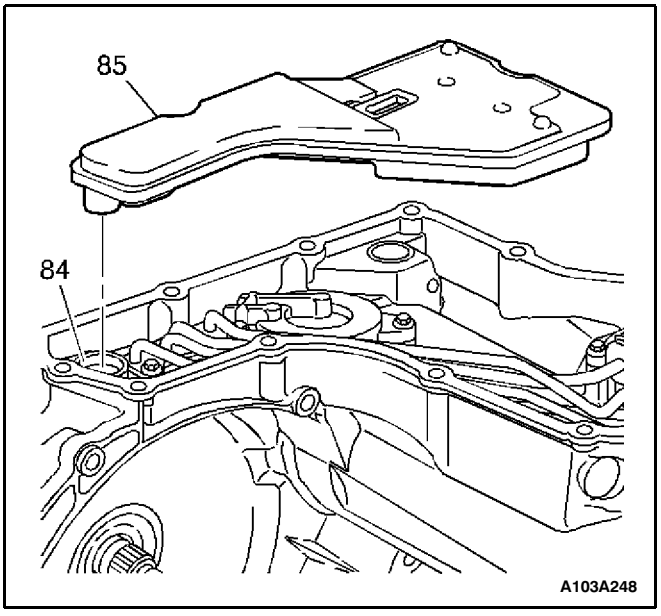
5. Install new oil feed pipe seal rings (82) if necessary.
6. Retain any newly installed oil feed pipe seal rings (82) with J 36850 or equivalent.
7. Install the oil feed pipe assembly (83) onto the transmission case (51).
8. Install the four oil feed pipe bolts (81). Hand start and then tighten the bolts to 12 N•m (9 lb-ft).



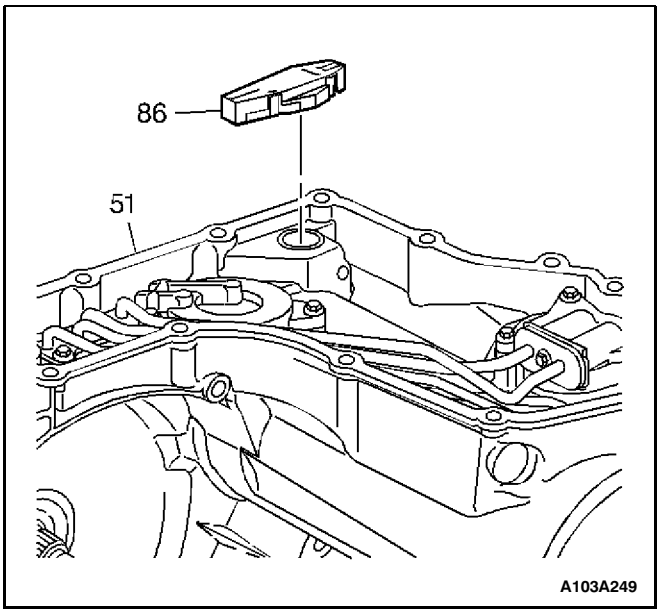
FILTER ASSEMBLY AND SEAL INSTALL

Important: In order to prevent damage to the case bore and seal, tap gently and evenly of the seal (84).

1. Install a new oil filter seal (84) into the transmission case (51). Use a large socket in order to tap on the seal.

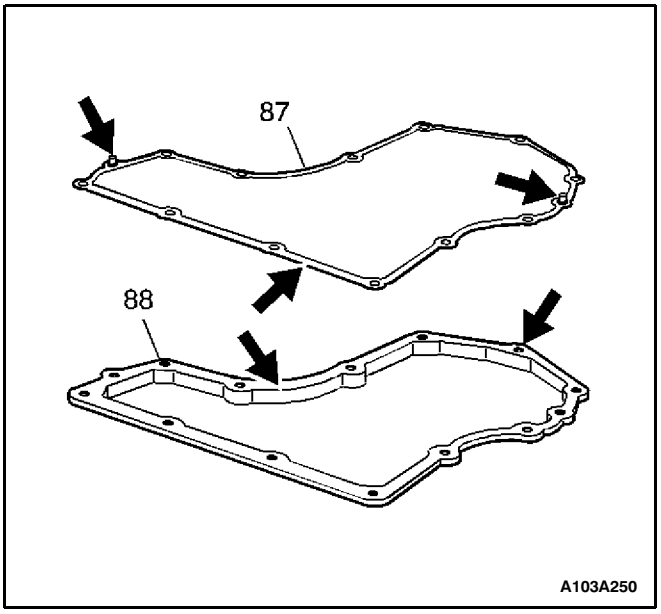


2. Install a new filter assembly (85) into the filter seal (81). If necessary, twist the filter slightly during installation.



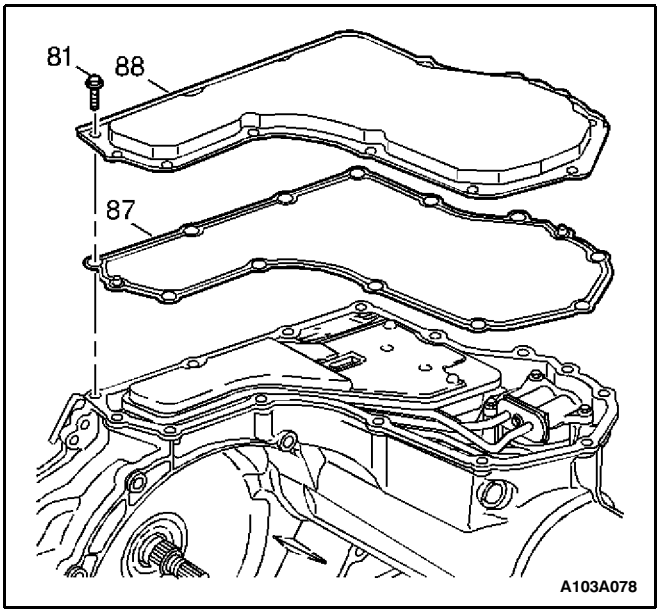
OIL LEVEL CONTROL VALVE INSTALL

Install the oil level control valve into the transmission case (51). Push straight down on the center of the oil level control valve in order to prevent damage to the case bore.

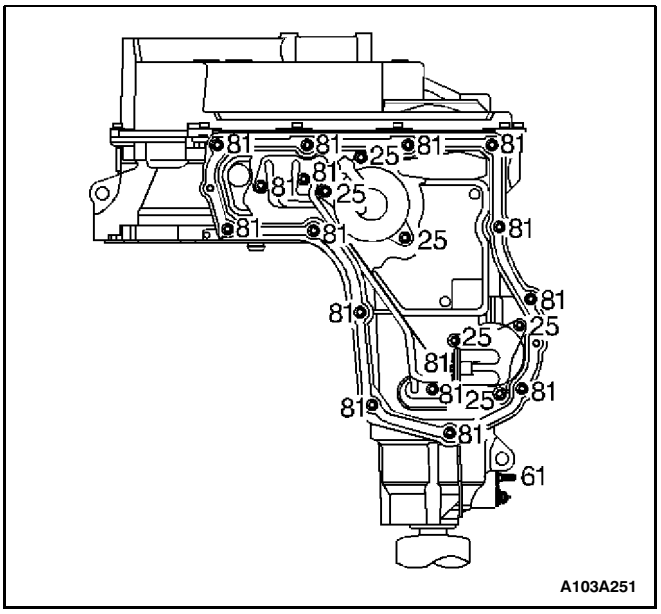


OIL PAN AND GASKET INSTALL

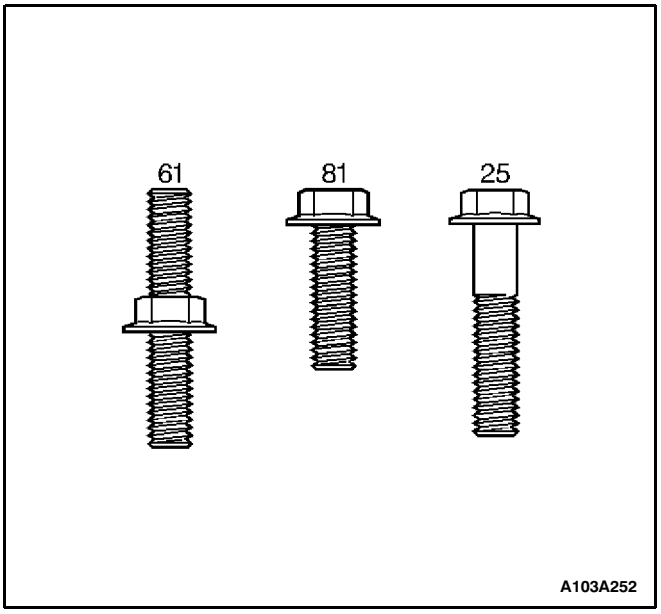
1. **Inspect the oil pan (88) for cracks, dents or damage to the gasket sealing surface.**
2. **Inspect the gasket (87) for cuts or other damage. The bottom pan gasket is reusable if not damaged.**
3. **Clean and dry the bottom pan and gasket.**



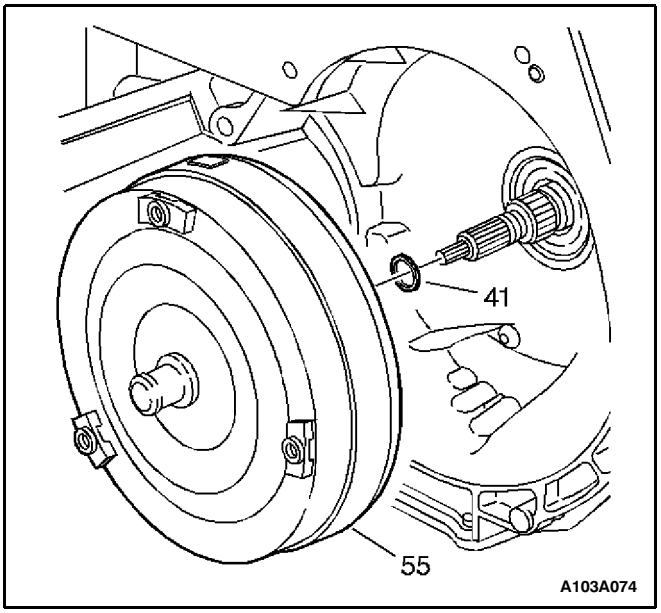
4. **Install the gasket and bottom pan onto the transmission case.**



5. Install the twelve bottom pan bolts (81).



6. Hand start and then tighten the bottom pan bolts to 12 N•m (9 lb-ft).



TORQUE CONVERTER INSTALLATION

Tools Required

J 21366 Torque Converter Holding Strap

1. Install a new turbine shaft O-ring (41) on the end of the turbine shaft.
2. Install the torque converter onto the transmission.
3. Install the J 21366.
4. Remove the transmission from the holding fixture.

GENERAL DESCRIPTION AND SYSTEM OPERATION

TRANSAXLE DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations are provided to establish a common language for describing transaxle-related conditions. These terms are used in the transaxle section of this manual.

Throttle Positions

- Minimum Throttle - the least amount of throttle opening required for an upshift.
- Light Throttle - approximately 1/4 of accelerator pedal travel (25% throttle position).
- Medium Throttle - approximately 1/2 of accelerator pedal travel (50% throttle position).
- Heavy Throttle - approximately 3/4 of accelerator pedal travel (75) throttle position).
- Wide Open Throttle (WOT) - full travel of the accelerator pedal (100% throttle position).
- Full Throttle Detent Downshift - a quick apply of the accelerator pedal to its full travel, forcing a downshift.
- Zero Throttle Coastdown - a full release of the accelerator pedal while the car is in motion and in drive range.
- Engine Braking - a condition where the engine is used to slow the car by manually downshifting during a zero throttle coastdown.

Shift Conditions

- Bump - a sudden and forceful apply of a clutch or band.
- Chuggle - a bucking or jerking that may be most noticeable when the converter clutch is engaged; similar to the feel of towing a trailer.
- Delayed - a condition where a shift is expected but does not occur for a period of time. Samples of this could be described as clutch or band engagement that does not occur as quickly as expected during a part throttle or wide open throttle apply of the accelerator or, when manually downshifting to a lower range. Also defined as "LATE" or "EXTENDED."
- Double Bump (Double Feel) - two sudden and forceful applies of a clutch or band.
- Early - a condition where the shift occurs before the car has reached proper speed. Tends to labor the engine after the upshift.
- End Bump - a firmer feel at the end of a shift as compared to the feel at the start of the shift. Also defined as "END FEEL" or "SLIP BUMP."
- Firm - a noticeably quick apply of a clutch or band that is considered normal with a medium to heavy throttle. Should not be confused with "HARSH" or "ROUGH."
- Flare - a quick increase in engine RPM along with a momentary loss of torque. This most generally occurs during a shift. Also defined as "SLIPPING."
- Harsh (Rough) - a more noticeable apply of a clutch or band as compared with "FIRM." This condition is considered undesirable at any throttle position.
- Hunting - a repeating quick series of upshifts and downshifts that causes a noticeable change in engine RPM. An example could be described as a 4-3-4 shift pattern. Also defined as "BUSYNESS."
- Initial Feel - a distinct firmer feel at the start of a shift as compared to the finish of the shift.
- Late - a shift that occurs when the engine is at a higher than normal RPM for a given amount of throttle.
- Shudder - a repeating jerking condition similar to "CHUGGLE" but more severe and rapid. This condition may be most noticeable during certain ranges of car speed.
- Slipping - a noticeable increase in engine RPM without a car speed increase. A slip usually occurs during or after initial clutch or band apply.
- Soft - a slow, almost unnoticeable clutch or band apply with very little shift feel.
- Surge - a repeating engine related condition of acceleration and deceleration that is less intense than "CHUGGLE."
- Tie-Up - a condition where two opposing clutches and/or bands are attempting to apply at the same time causing the engine to labor with a noticeable loss of engine RPM.

Noise Conditions

- Drive Link Noise - a whine or growl that increases or fades with engine RPM. Noise is not noticeable under light throttle acceleration or in "DRIVE" or "REVERSE" with the car stationary.
- Final Drive Noise - a hum related to car speed and is most noticeable under light throttle acceleration or zero throttle coast down.
- Planetary Gear Noise - a whine, most noticeable in first gear and reverse that is related to vehicle speed. A gear noise condition may become less noticeable or go away after an upshift.
- Pump Noise - a high pitch whine that increases intensity with engine RPM. This condition may also be noticeable in ALL operating ranges.
- Torque Converter - a whine usually noticed when a vehicle is stopped and transaxle is in "DRIVE" or "REVERSE." The noise will increase with engine RPM. See Torque Converter Evaluation for further information.

Abbreviations

- TCM - Transmission Control Module
- TCC Sol. Valve - Torque Converter Clutch Solenoid Valve
- TP Sensor - Throttle Position Sensor
- ECT Sensor - Engine Coolant Temperature Sensor
- A/T OSS Sensor - Automatic Transmission Output Shaft Speed Sensor
- A/T ISS Sensor - Automatic Transmission Input Shaft Speed Sensor
- NC - Normally Closed
- NO - Normally Open
- PCS - Pressure Control Solenoid
- TFP Val Position Sw. - Transmission Fluid Pressure Valve Position Switch
- PWM - Pulse Width Modulated
- WOT - Wide Open Throttle
- RPM - Revolutions Per Minute
- ECM - Electronic Control Module
- PM - Permanent Magnet
- A/C - Air Conditioning
- MAP - Manifold Absolute Pressure
- TFT - Transmission Fluid Temperature (Sensor)
- AC - Alternating Current
- DC - Direct Current
- CKT - Circuit
- DTC - Diagnostic Trouble Code
- DVM - Digital Volt Meter
- OBD - On Board Diagnostics
- DLC - Diagnostic Link Connector
- EGR - Exhaust Gas Recirculation

TRANSAXLE GENERAL DESCRIPTION

The 4T40-3 is a fully automatic, electronically-controlled front wheel drive transaxle. It provides four forward gear ranges including overdrive and one reverse gear range. Shift points are controlled by the TCM through two shift solenoids. Oil pressure is supplied by a vane-type pump and is regulated electronically by the TCM through the Pressure Control Solenoid (PC Sol. Valve).

The transaxle can be operated in any one of the following seven modes.

- P - Park position prevents the vehicle from rolling either forward or backward. (For safety reasons, the parking should be used in addition to the park position.)
- R - Reverse allows the vehicle to be operated in a rearward direction.
- N - Neutral allows the engine to be started and operated while driving the vehicle. If necessary, this position may be selected if the engine must be restarted with the vehicle moving.
- D - Overdrive Range is used for all normal driving conditions. It provides four gear ratios plus converter clutch operation. Downshifts are available for safe passing by depressing the accelerator.
- 3 - Drive Range position is used for city traffic, hilly terrain and trailer towing. It provides three gear ratios and prevents the transaxle from operating in fourth gear. Again, downshifts are available by depressing the accelerator.
- 2 - Manual Second Range only provides two gear ratios (under most operating conditions). It is used to provide acceleration and engine braking. This range may be selected at any vehicle speed, but the transaxle will not downshift into Second gear until vehicle speed drops below approximately 100 km/h (62 mph).
- 1 - Manual Lo Range is used to provide maximum engine braking. This range may also be selected at any vehicle speed, but the transaxle will not downshift into First gear until vehicle speed drops below approximately 60 km/h (37 mph).

TRANSAXLE COMPONENT AND SYSTEM DESCRIPTION

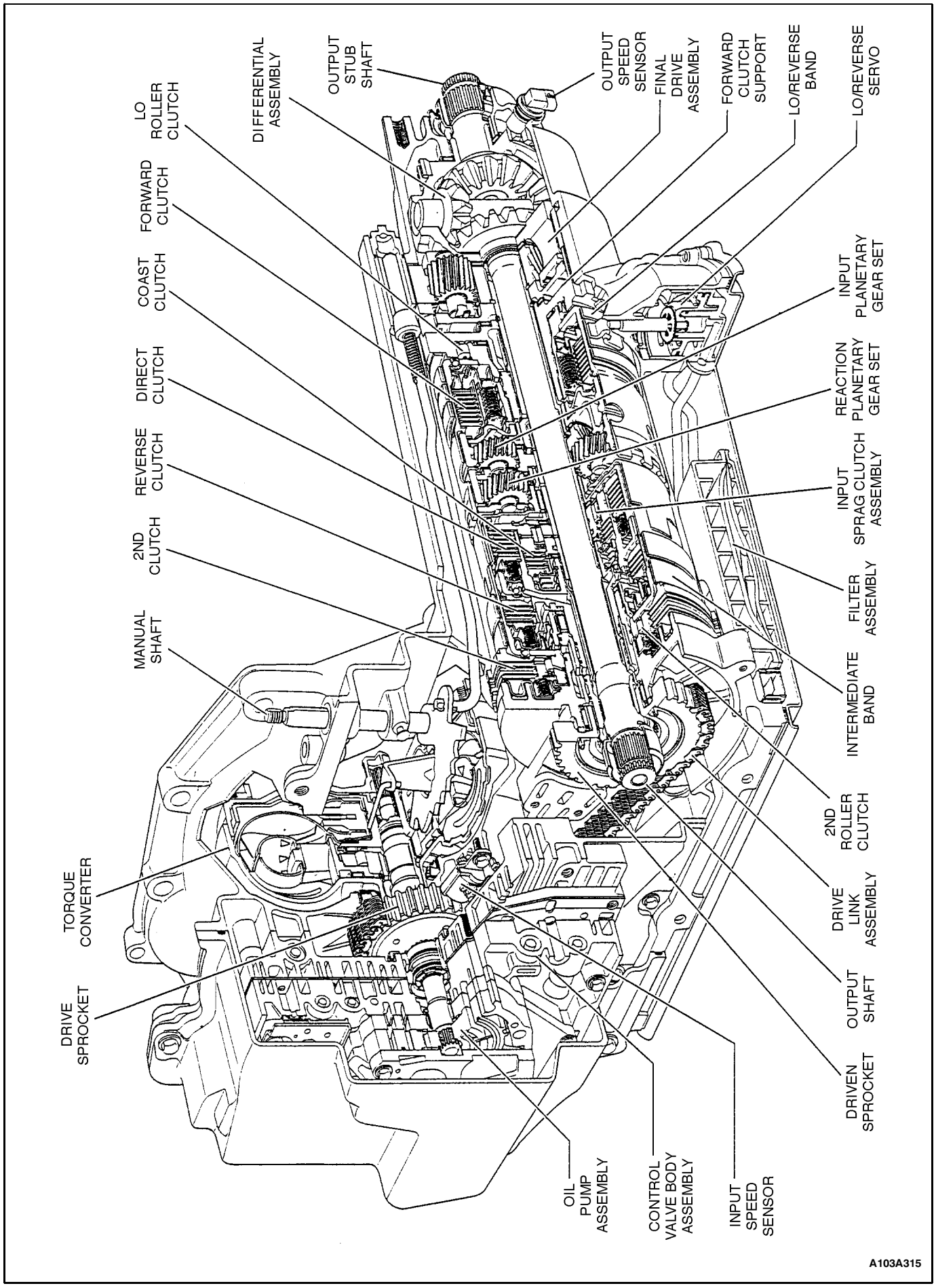
The 4T40-E transaxle consists primarily of the following components.

Mechanical

- Torque converter with TCC
- Drive link assembly
- Five multiple disk clutch assemblies: 2nd, Reverse, Direct, Coast and Forward
- Two friction bands: Intermediate/4th band and Lo/Reverse band
- Three one-way clutches: two roller clutches (2nd and Lo) and one sprag clutch
- Two planetary gear sets: Input and Reaction
- Final drive and differential assembly
- One control valve assembly
- One vane-type oil pump

Electronic

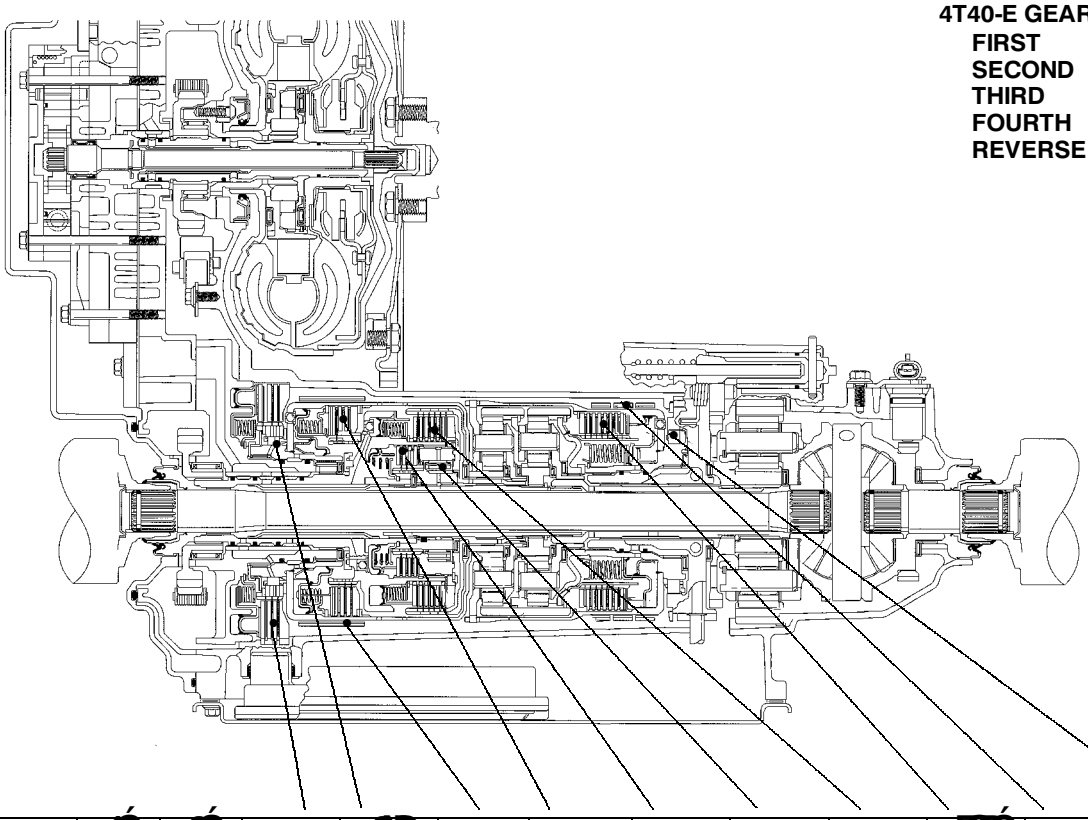
- Pressure Control Solenoid Valve (PC Sol. Valve)
- Two shift solenoids: 1-2 and 2-3
- TCC solenoid valve
- Two speed sensors: A/T ISS and A/T OSS
- Fluid temperature sensor
- Automatic Transmission Fluid Pressure (TFP) Manual Valve Position Switch
- Wiring harness assembly


LO ROLLER CLUTCH
FORWARD CLUTCH
COAST CLUTCH
DIRECT CLUTCH
REVERSE CLUTCH
2ND CLUTCH
MANUAL SHAFT
TORQUE CONVERTER
DRIVE SPROCKET
DIFFERENTIAL ASSEMBLY
OUTPUT STUB SHAFT
OUTPUT SPEED SENSOR
FINAL DRIVE ASSEMBLY
FORWARD CLUTCH SUPPORT
LO/REVERSE BAND
LO/REVERSE SERVO
INPUT PLANETARY GEAR SET
REACTION PLANETARY GEAR SET
INPUT SPRAG CLUTCH ASSEMBLY
FILTER ASSEMBLY
INTERMEDIATE BAND
2ND ROLLER CLUTCH
DRIVE LINK ASSEMBLY
OUTPUT SHAFT
DRIVEN SPROCKET
OIL PUMP ASSEMBLY
CONTROL VALVE BODY ASSEMBLY
INPUT SPEED SENSOR
A103A315

RANGE REFERENCE CHART

4T40-E GEAR RATIOS

FIRST	2.96
SECOND	1.62
THIRD	1.00
FOURTH	0.68
REVERSE	2.14



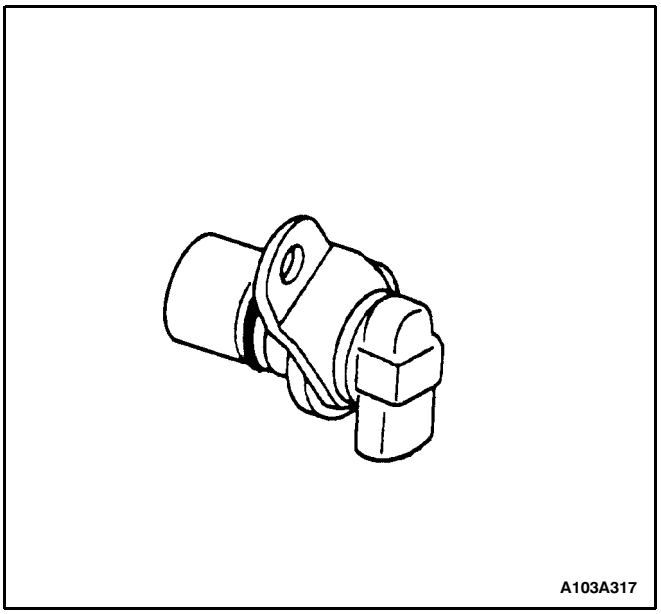
RANGE	GEAR	1-2 SHIFT SOL.	2-3 SHIFT SOL.	2ND CLUTCH	2ND ROLLER CLUTCH	INTERMEDIATE BAND	REVERSE CLUTCH	FORWARD CLUTCH	INPUT SPRAG	DIRECT CLUTCH	FORWARD CLUTCH	LOW/REV BAND	LOW ROLLER CLUTCH
PARK	N	ON	OFF									APPLIED	
REV	R	ON	OFF				APPLIED					APPLIED	
NEU	N	ON	OFF									APPLIED	
D	1st	ON	OFF						HOLDING		APPLIED		HOLDING
	2nd	OFF	OFF	APPLIED	HOLDING				HOLDING		APPLIED		OVERRUNNING
	3rd	OFF	ON	APPLIED*	OVERRUNNING				HOLDING	APPLIED	APPLIED		OVERRUNNING
	4th	ON	ON	APPLIED*		APPLIED		APPLIED	OVERRUNNING	APPLIED	APPLIED*		OVERRUNNING
3	1st	ON	OFF					APPLIED	HOLDING		APPLIED		HOLDING
	2nd	OFF	OFF	APPLIED	HOLDING			APPLIED	HOLDING		APPLIED		OVERRUNNING
	3rd	OFF	ON	APPLIED*	OVERRUNNING			APPLIED	HOLDING	APPLIED	APPLIED		OVERRUNNING
2	1st	ON	OFF					APPLIED	HOLDING		APPLIED		HOLDING
	2nd	OFF	OFF	APPLIED	HOLDING	APPLIED		APPLIED	HOLDING		APPLIED		OVERRUNNING
	3rd*	OFF	ON	APPLIED*	OVERRUNNING			APPLIED	HOLDING	APPLIED	APPLIED		OVERRUNNING
1	1st	ON	OFF					APPLIED	HOLDING		APPLIED	APPLIED	HOLDING
	2nd**	OFF	OFF	APPLIED	HOLDING	APPLIED		APPLIED	HOLDING		APPLIED		OVERRUNNING

ON = SOLENOID ENERGIZED
OFF = SOLENOID DE-ENERGIZED
* = APPLIED WITH NO LOAD.
** = MANUAL SECOND - THIRD GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 100 km/h (62 mph).
*** = MANUAL FIRST - SECOND GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 60 km/h (37 mph).
NOTE: MANUAL FIRST - THIRD GEAR IS ALSO POSSIBLE AT HIGH VEHICLE SPEED AS A SAFETY FEATURE.

A103A316

AUTOMATIC TRANSMISSION OUTPUT (SHAFT) SPEED SENSOR (A/T OSS)

The vehicle A/T OSS is a magnetic inductive pickup that relays information relative to vehicle speed to the TCM. Vehicle speed information is used by the TCM to control shift timing, line pressure, and TCC apply and release.



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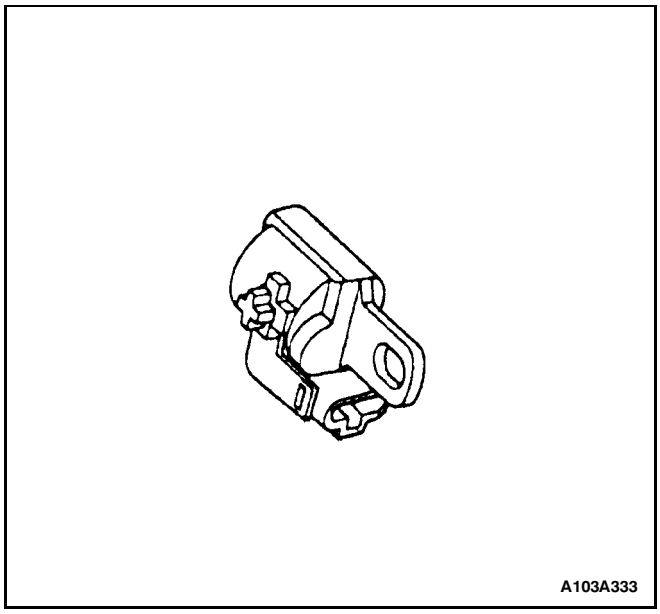
The output speed sensor mounts in the case at the speed sensor rotor which is pressed onto the differential. An air gap of 0.27-1.57 mm (0.011-0.062 inch) is maintained between the sensor and the teeth on the speed sensor rotor. The sensor consists of a permanent magnet surrounded by a coil of wire. As the differential rotates, an AC signal is induced in the vehicle speed sensor. Higher vehicle speeds induce a higher frequency and voltage measurement at the sensor.

Sensor resistance should measure between 1500-1750 ohms at 20°C (68°F). Output voltage will vary with vehicle speed from a minimum of 0.5 volts AC at 25 RPM to 200 volts at 1728 RPM.

AUTOMATIC TRANSMISSION INPUT (SHAFT) SPEED SENSOR (A/T ISS)

The A/T ISS is a magnetic inductive pickup that relays information relative to transaxle input speed to the TCM. The TCM uses transaxle input speed information to control line pressure, TCC apply and release and transaxle shift patterns. This information is also used to calculate the appropriate operating gear ratios and TCC slippage.



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The input speed sensor mounts on the transaxle case under the channel plate and next to the drive sprocket. An air gap of 0.26-2.90 mm (0.010-0.114 inch) is maintained between the sensor and the teeth on the drive sprocket. The sensor consists of a permanent magnet surrounded by a coil of wire. As the drive sprocket is driven by the turbine shaft, an AC signal is induced in the input speed sensor. Higher vehicle speeds induce a higher frequency and voltage measurement at the sensor.

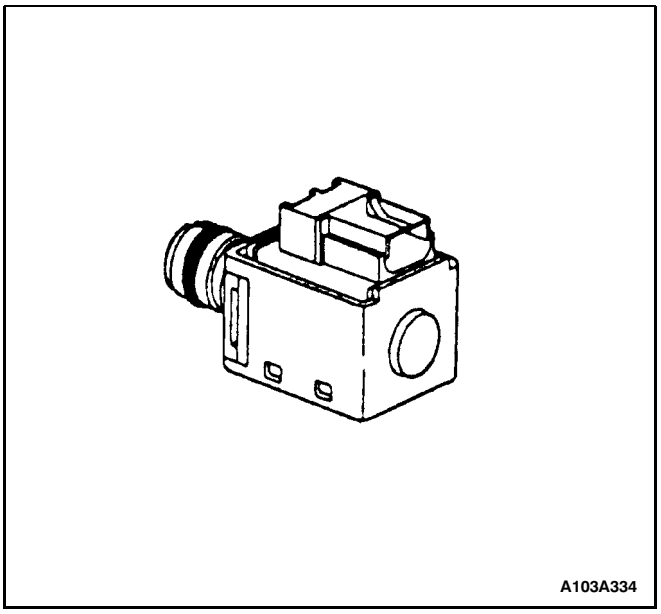
Sensor resistance should measure between 625-725 ohms at 20°C (68°F). Output voltage will vary with vehicle speed from a minimum of 0.5 volts AC at 550 RPM to 200 volts at 7000 RPM.

SHIFT SOLENOIDS: 1-2 AND 2-3

The shift solenoids are two identical, normally open electronic exhaust valves that control upshifts and downshifts in all forward gear ranges. These shift solenoids work together in a combination of ON and OFF sequences to control the positions of the 1-2, 2-3 and 3-4 shift valve trains. The TCM monitors numerous inputs to determine the appropriate solenoid state combination and transmission gear for the vehicle operating conditions.

Gear	Solenoid 1-2	Solenoid 2-3
Park, Reverse, Neutral*	ON	OFF
First	ON	OFF
Second	OFF	OFF
Third	OFF	ON
Fourth	ON	ON

*The solenoid states are normally on (1-2) and off (2-3) in P, R, N. However, these may change based on vehicle speed and throttle position.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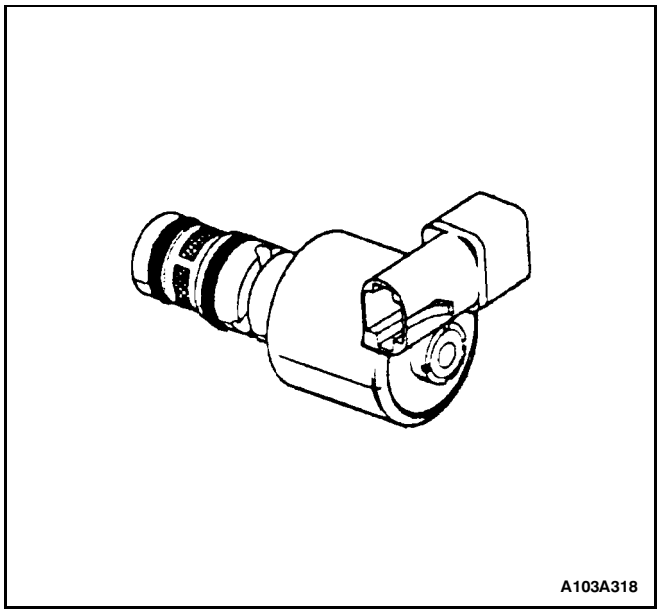
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The TCM energizes the shift solenoids by providing a ground to the solenoid's electrical circuit. This sends current through the coil winding of the solenoid, thereby creating a magnetic field. The magnetic field repels the plunger inside the solenoid which seats the solenoid metering ball against the fluid inlet port. This action prevents the exhaust of fluid through the solenoid and provides an increase in fluid pressure at the end of the shift valves. This fluid pressure initiates an upshift by moving the shift valves (refer to the oil flow diagrams for a complete description of the hydraulic control of the shift valves for each gear range).

Shift solenoids resistance should measure between 19-24 ohms when measured at 20°C (68°F) and between 24-31 ohms when measured at 88°C (190°F).

The shift solenoids should energize when the voltage is greater than 7.5 volts. The shift solenoids should de-energize when the voltage is less than one volt.

PRESSURE CONTROL SOLENOID VALVE (PC SOL. VALVE)

The pressure control solenoid valve (PC sol. valve) is a precision electronic pressure regulator that controls transaxle line pressure based on current flow through its coil windings. As current flow is increased the magnetic field produced by the coil moves the solenoid's plunger further away from the exhaust port. Opening the exhaust port decreases the output fluid pressure regulated by the PC sol. valve, which ultimately decreases line pressure. The TCM controls the PC sol. valve based on various inputs including throttle position, fluid temperature, MAP sensor and gear state.

The TCM controls the PC sol. valve on a positive duty cycle at a fixed frequency of 614 Hz (cycles per second). Duty cycle is defined as the percent of time current is flowing through the solenoid coil during each cycle. A higher duty cycle provides a greater current flow through the solenoid. The high (positive) side of the PC sol. valve electrical circuit at the TCM controls the PC sol. valve operation. The TCM provides a ground path for the circuit, monitors average current and continuously varies the PC sol. valve duty cycle to maintain the correct average current flowing through the PC sol. valve.

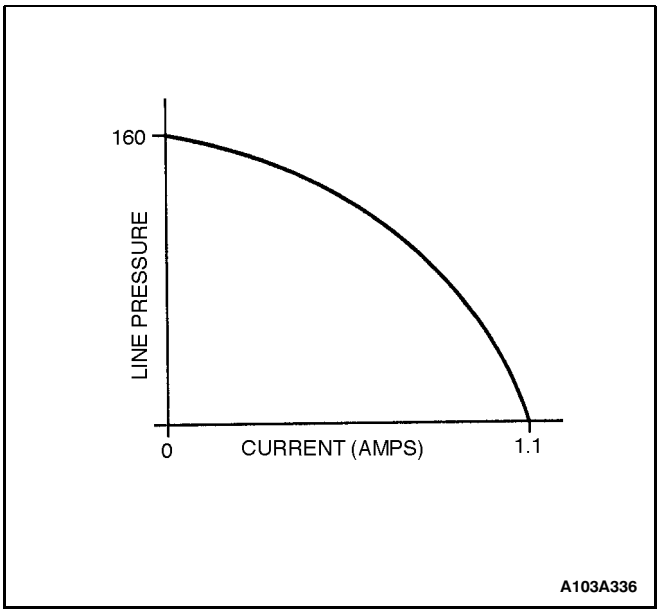
Duty Cycle	Current	Line Pressure
+5%	0.02 amps	Maximum
+40%	1.1 amps	Minimum

Pressure control solenoid valve resistance should measure between 3.5 and 4.6 ohms when measured at 20°C (68°F).

Transmission Adapt Function

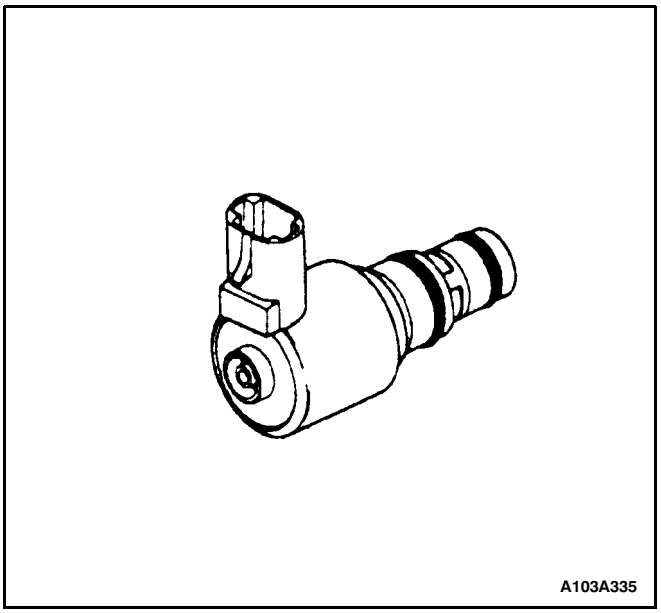
The 4T40-E uses a line pressure control system which has the ability to continuously adapt the system's line pressure (increase as needed) to compensate for normal wear of clutch fiber plates, seals, springs, etc. this "learning" feature is similar to what is used for fuel control (integrator/block learn) and throttle position (idle learn). The TCM maintains several adapt parameters for the transaxle:

- Upshift Adapt - The TCM monitors the TIS sensor and VSS during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the transaxle pressure control solenoid signal to maintain a set shift feel.



TORQUE CONVERTER CLUTCH SOLENOID VALVE (TCC SOL. VALVE)

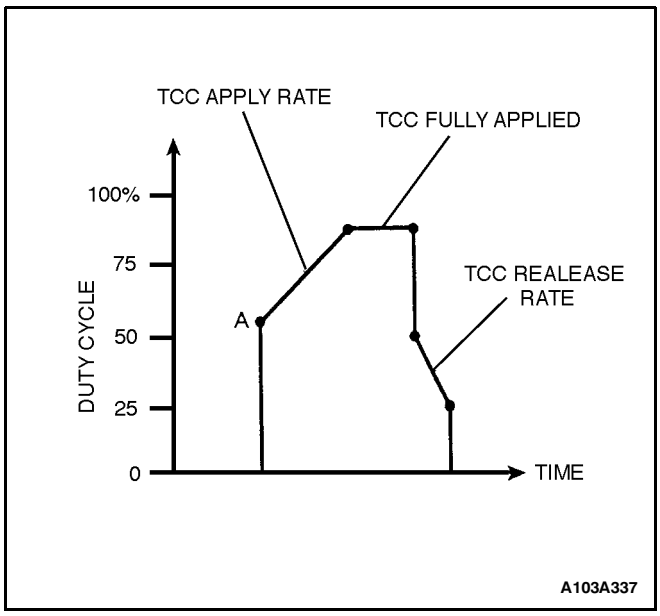
The TCC solenoid valve is a normally closed, pulse width modulated (PWM) solenoid used to control the apply and release of the converter clutch. The TCM operates the solenoid with a negative duty cycle at a fixed frequency of 42 Hz to control the rate of TCC apply/release. The solenoid's ability to "ramp" the TCC apply and release pressures results in a smoother TCC operation.



When vehicle operating conditions are appropriate to apply the TCC the TCM immediately increases the duty cycle to approximately 68% (see point A on graph). The TCM then ramps the duty cycle up to approximately 93% to achieve full TCC apply pressure. The rate at which the TCM increases the duty cycle controls the TCC apply. Similarly, the TCM also ramps down the TCC solenoid duty cycle to control TCC release.

There are some operating conditions that prevent or enable TCC apply under various conditions (refer to the temperature sensor description). Also, if the TCM receives a high voltage signal from the brake switch, signalling that the brake pedal is depressed, the TCM immediately releases the TCC.

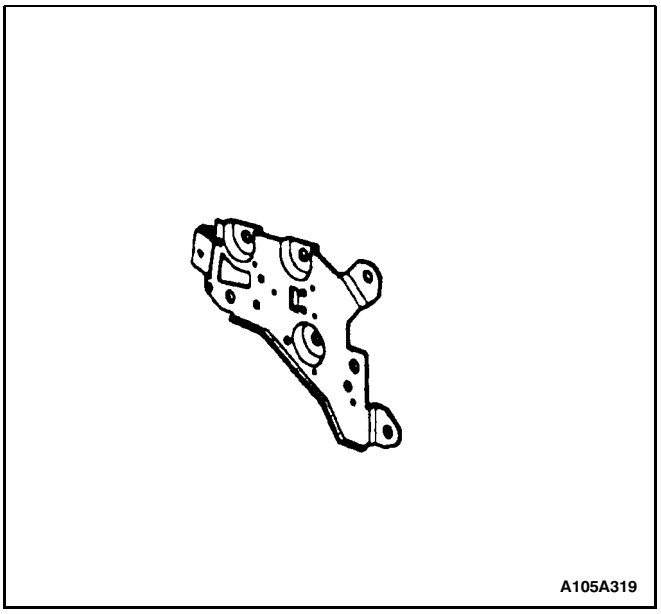
Important: Duty cycles given are for example only. Actual duty cycles will vary depending on vehicle application and vehicle operating conditions.



TCC solenoid valve resistance should measure between 10.4 and 10.8 ohms when measured at 20°C (68°F). The resistance should measure approximately 16 ohms at 150°C (300°F).

AUTOMATIC TRANSMISSION FLUID PRESSURE MANUAL VALVE POSITION SWITCH (TFP VAL. POSITION SW.)

The pressure switch assembly (TFP val. position sw.) is attached to the valve body and contains six fluid pressure switches and the transaxle temperature sensor (refer to the separate description of the temperature sensor). Five of the fluid pressure switches (PRND4, DRIVE, LO, D21, REV) are normally open and are used to indicate the position of the manual valve. The TCM uses this information to control line pressure, TCC apply and release and shift solenoid operation.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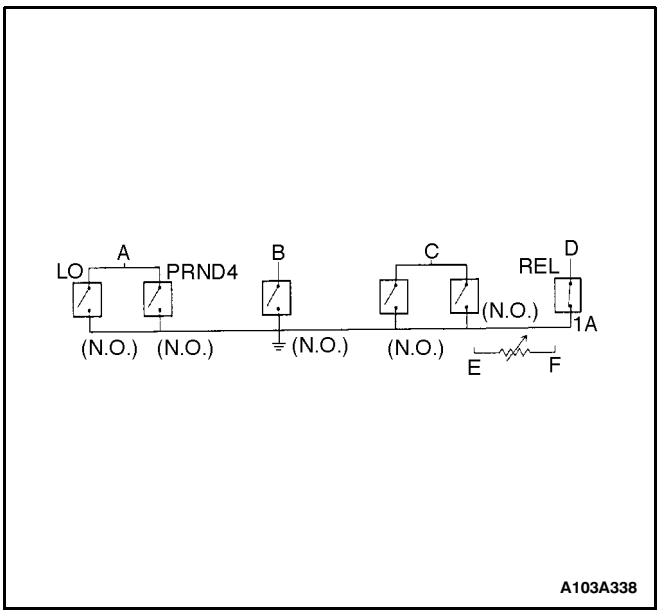
The RELEASE pressure switch is a normally closed pressure switch. This switch is used as a diagnostic tool to confirm that the TCC is actually OFF when it has been commanded OFF by the TCM.

Each fluid pressure switch produces either an open or ground to the TCM depending on the presence of fluid pressure at the switches. The sequence of open and closed switches produces a combination of voltage readings that are monitored by the TCM (see chart and switch logic diagram).



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The TCM measures TFP val. position sw. signal voltage from each pin to ground and compares the voltage to a TFP val position sw. combination chart stored in the TCM memory. If the TCM does not recognize the switch sequence a diagnostic code will be set as a result. A diagnostic code may also be set if the TFP val. position sw. switch sequence indicates a gear range selection that conflicts with other sensory inputs to the TCM.

Range Indicator	Fluid*					Circuit +		
	REV	PRND4	DR	D21	LO	A	B	C
Park/Neutral	0	1	0	0	0	1	0	0
Reverse	1	1	0	0	0	1	0	1
Overdrive	0	1	1	0	0	1	1	0
Manual Third	0	0	1	0	0	0	1	0
Manual Second	0	0	1	1	0	0	1	1
Manual First	0	0	1	1	1	1	1	1

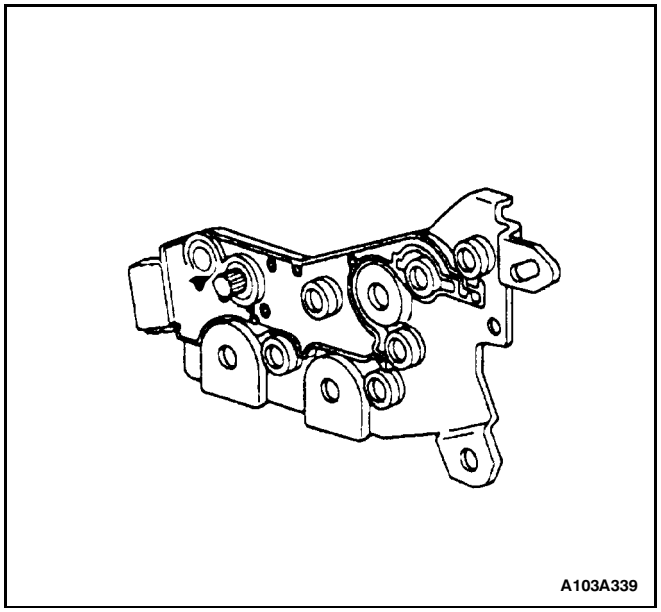
*: 1 = Pressurized
0 = Exhausted

+: 1 = Grounded (resistance <50 ohms, 0 volts)
0 = Open (Resistance >50k ohms, 12 volts)

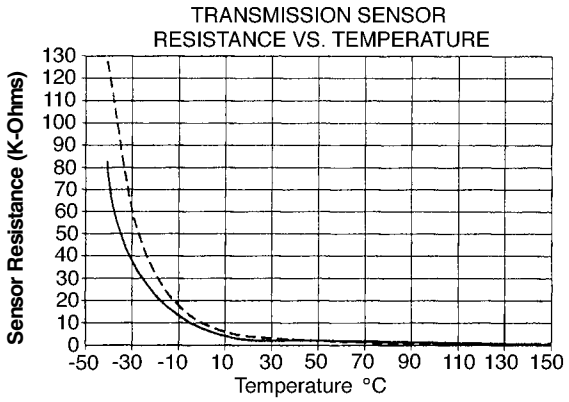
Important: Resistance should be measured with the engine running. When the transaxle pass thru connector is disconnected from the vehicle harness and the engine is running, multiple diagnostic codes will be set. Be sure to clear these codes when finished with this procedure.

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR

The TFT sensor is a negative temperature coefficient thermistor (temperature sensitive resistor) that provides information to the TCM regarding transmission fluid temperature. The temperature sensor is integrated in the TFP val. position sw. which is volted to the valve body. The sensor monitors pressurized main line pressure from the inside of the valve body to determine the operating temperature of the transaxle fluid. The sensor, similar to each of the TFP val. position sw., uses an O-ring seal to maintain fluid pressure in the valve body.


A103A339

The internal electrical resistance of the sensor varies in relation to the operating temperature of the transmission fluid (see chart).



The TCM sends a 5 volt reference signal to the temperature sensor and measures the voltage drop in the electrical circuit. A lower fluid temperature creates a higher resistance in the temperature sensor, thereby measuring a higher voltage signal.

The TCM measures this voltage as another input to help control line pressure, shift schedules and TCC apply. When transaxle fluid temperature reaches 140°C (284°F) the TCM enters "hot mode." Above this temperature the TCM modifies transmission shift schedules and TCC apply in an attempt to reduce fluid temperature by reducing transmission heat generation. During hot mode the TCM applies the TCC at all times in third and fourth gears. Also, the TCM performs the 2-3 and 3-4 shifts earlier to help reduce fluid heat generation. Hot mode may not be available on some applications.

Transmission Sensor - Temperature To Resistance To Voltage (approximate)		
°C	R low (ohms)	R high (ohms)
0	7987	10859
10	4934	6407
20	3106	3923
30	1991	2483
40	1307	1611
50	878	1067
60	605	728
70	425	507
80	304	359
90	221	259
100	163	190

TRANSMISSION ELECTRICAL CONNECTOR

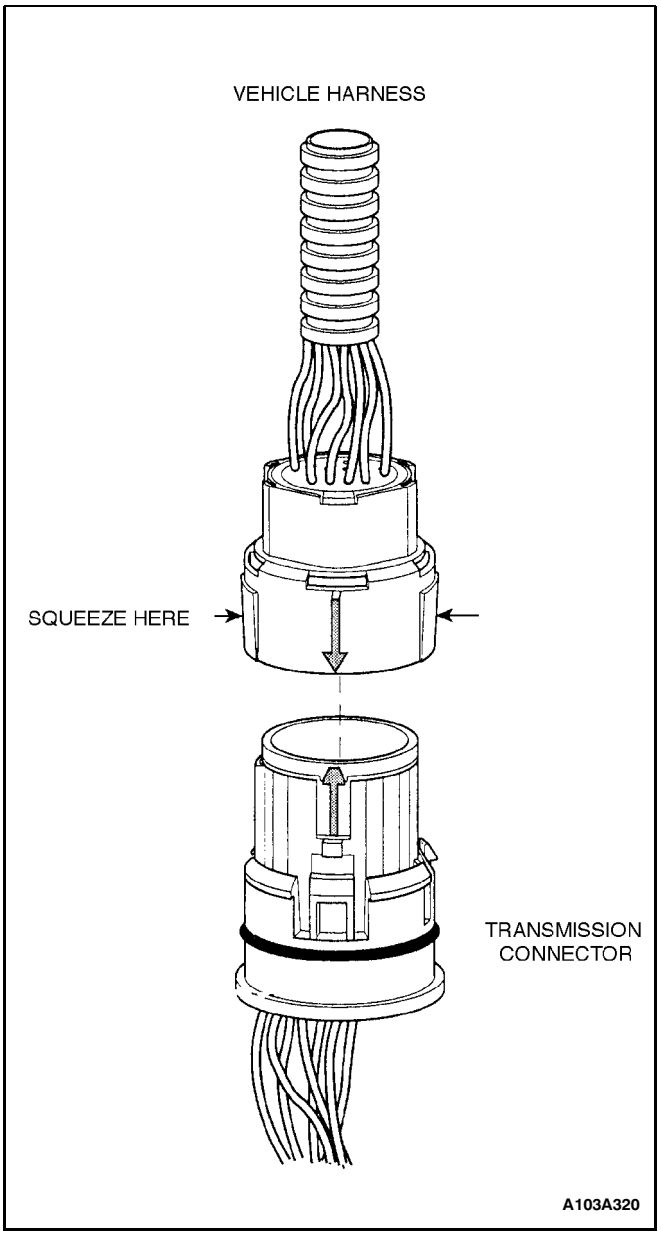
The transmission electrical connector is a very important part of the transmission operating system. Any interference with the electrical connection can cause the transmission to set Diagnostic Trouble Codes (DTCs) and/or affect proper operation.

The following items can affect the electrical connection:

- Bent pins in the connector from rough handling during connection and disconnection.
- Wires backing away from the pins or coming uncrimped (in either internal or external wiring harness).
- Dirt contamination entering the connector when disconnected.
- Pins in the internal wiring connector backing out of the connector or pushed out during reconnection.
- Excessive transmission fluid leaking into the connector, wicking up into the external wiring harness, and degrading the wire insulation.
- Water/moisture intrusion in the connector.
- Low pin retention in the external connector from excessive connection and disconnection of the wiring connector assembly.
- Pin corrosion from contamination.
- Broken/cracked connector assembly.

Points to remember when working with the transmission wiring connector assembly:

- To remove the connector, squeeze the two tabs towards each other and pull straight up (refer to the illustration).



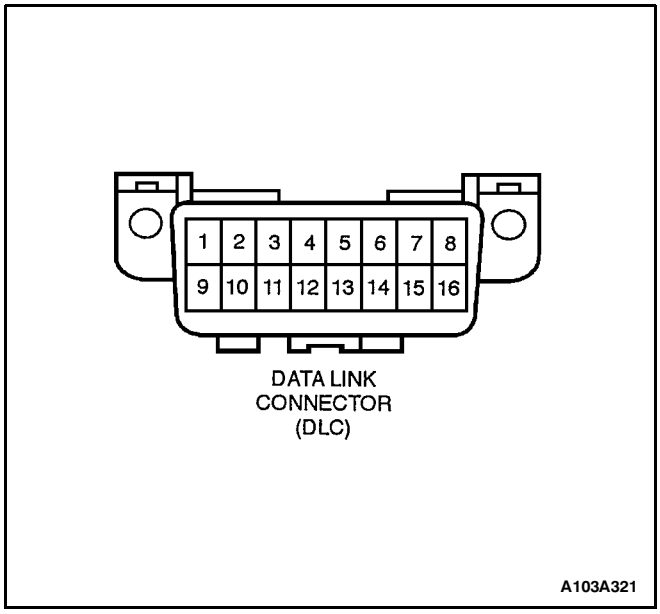
- **Carefully limit twisting or wiggling the connector during removal. Bent pins can occur.**
- **DO NOT pry the connector off with a screwdriver or other tool.**
- **To reinstall the external wiring connector, first orient the pins by lining up the arrows on each half of the connector. Push the connector straight down into the transmission without twisting or angling the mating parts.**
- **The connector should click into place with a positive feel and/or noise.**
- **Whenever the transmission external wiring connector is disconnected from the internal harness and the engine is operating DTC(s) will set. Clear these DTC(s) after reconnecting the external connector.**

TRANSMISSION CONTROL MODULE (TCM)

The transmission control module (TCM) is an electronic device which monitors inputs to control various transmission functions including shift quality and transmission diagnostics. The TCM receives input information from sensors, switches, and components to process for use within its' control program. Based on this input information, the TCM controls various transmission output functions and devices.

DATA LINK CONNECTOR (DLC)

The data link connector (DLC) is a multiple cavity connector. The DLC provides the means to access serial data from the TCM to aid in powertrain diagnosis. The DLC allows the technician to use a scan tool to monitor various systems and display diagnostic trouble codes (DTCs). The DLC connector is located within the driver's compartment, directly below the steering column.



TCM INPUTS THAT AFFECT THE 4T40-E TRANSMISSION

Throttle Position Sensor

- **Provides throttle position data to the TCM for determining shift patterns and TCC apply/release.**
- **An incorrect throttle position sensor input could cause erratic or shift pattern, poor shift quality or TCC function.**

Automatic Transmission Output (Shaft) Speed Sensor

- Provides vehicle speed data to the TCM for determining shift patterns, TCC apply/release, and gear ratio calculations.
- An incorrect A/T OSS input could cause erratic or shift pattern, poor shift quality or TCC function.

Automatic Transmission Input (Shaft) Speed Sensor

- Provides transaxle input speed data to the TCM for controlling line pressure, shift patterns, TCC apply and release and calculating gear ratio.

Engine Coolant Temperature Sensor

- Provides coolant temperature data to the TCM for determining initial TCC engagement.
- An incorrect engine coolant temperature sensor input could cause an incorrect initial TCC apply.

Cruise Control

- When engaged, the TCM alters the transaxle shift pattern to reduce the number of 3-4 upshifts and 4-3 downshifts. The TCM also alters TCC apply and release.

Engine Speed

- The ignition module provides engine speed data to the TCM.
- The TCM uses engine speed information for controlling wide open throttle shifts and the TCC PWM solenoid duty cycle.

Brake Switch

- Provides brake apply information to the TCM for controlling TCC apply and release.
- An incorrect TCC brake switch input could cause an incorrect TCC apply or release.

Automatic Transmission Fluid Pressure Manual Valve Position Switch (TFP Val. Position Sw.)

- Provides transaxle shift linkage position information to the TCM for determining transaxle range and shift patterns.
- An incorrect TFP val. position sw. input could cause incorrect shift points, poor shift quality, incorrect or inhibited TCC apply, incorrect line pressure, or erratic manual downshifts.

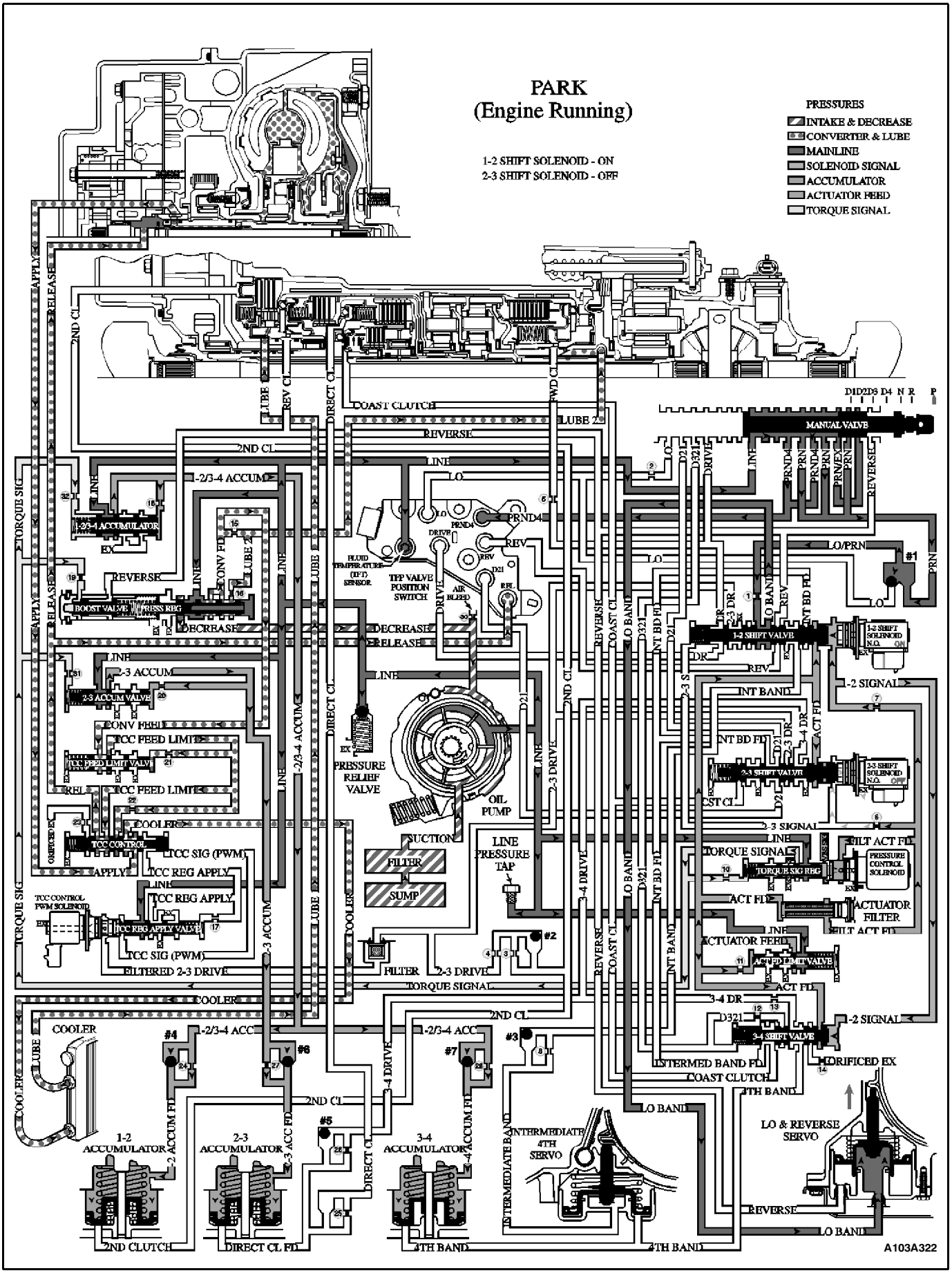
Transmission Fluid Temperature TFT Sensor

- Provides transaxle fluid temperature information to the TCM for determining alternate shift patterns and TCC apply during high temperature conditions (hot mode operation).
- An incorrect transaxle temperature sensor input could cause altered shift patterns, poor shift quality and incorrect TCC apply.

Manifold Absolute Pressure Sensor

- Measures intake manifold pressure which results from changes in engine load and speed. The TCM monitors this information to adjust line pressure and shift patterns.
- An incorrect MAP sensor input could cause altered shift patterns, shift feel and TCC apply.

PARK (ENGINE RUNNING)



When the gear selector lever is in the park (P) position and the engine is running, fluid is drawn into the oil pump and line pressure is directed to the pressure regulator valve.

Pressure Regulation

Pressure Regulator Valve: Regulates pump output (line pressure) in response to torque signal fluid pressure acting on the boost valve, spring force, and line pressure acting on the end of the valve. Line pressure is directed to the manual valve, both accumulator valves, torque signal regulator valve, TCC regulated apply valve, the temperature sensor in the TFP and the actuator feed limit valve. Also, line pressure feeds the converter feed fluid circuit through the pressure regulator valve.

Actuator Feed Limit (AFL) Valve: Line pressure is routed through the valve and into the actuator feed fluid circuit. The valve limits actuator feed fluid pressure to a maximum pressure. Actuator feed fluid is routed to the pressure control solenoid, each of the shift valves, and also feeds the 1-2 signal and 2-3 signal fluid circuits.

Pressure Control Solenoid (PCS): Controlled by the TCM, the PCS regulates filtered actuator feed fluid pressure acting on the end of the torque signal regulating valve.

Torque Signal Regulating Valve: Regulates line pressure into the torque signal fluid circuit. This regulation is controlled by filtered actuator feed fluid pressure from the PCS. Torque signal fluid pressure is routed to the accumulator valves and the boost valve to control shift feel.

Lo/Reverse Band Applies

Manual Valve: Mechanically controlled by the gear selector lever, the manual valve is in the park (P) position and directs line pressure into the PRND4 and PRN fluid circuits.

TFP: PRND4 fluid is routed to the PRND4 fluid pressure switch in the TFP and the TFP signals the TCM that the transaxle is in the park (P) position. Also, line pressure is routed to the temperature sensor in the TFP.

1-2 Shift Solenoid: Energized by the TCM, the normally open 1-2 shift solenoid is ON and blocks 1-2 signal fluid from exhausting. 1-2 signal fluid pressure acts on the 1-2 and 3-4 shift valves.

1-2 Shift Valve: 1-2 signal fluid pressure holds the valve in the downshifted position against spring force. Lo/PRN fluid is routed through the 1-2 shift valve and into the lo band fluid circuit.

Lo and Reverse Servo: Lo band fluid is routed to the inner area of the servo piston. Lo band fluid pressure moves the servo piston and pin assembly against spring force to apply the lo/reverse band.

2-3 Shift Solenoid: The normally open 2-3 shift solenoid is OFF and 2-3 signal fluid is exhausted through the solenoid.

2-3 Shift Valve: Spring force holds the 2-3 shift valve in the downshifted position.

3-4 Shift Valve: 1-2 signal fluid pressure holds the 3-4 shift valve against spring force in the first and fourth gear position.

Lube 2: The lube 2 fluid circuit is fed by line pressure at the pressure regulator valve. Lube 2 fluid is routed through the oil feed pipes and into the forward clutch support. Lube 2 fluid provides lubrication in the rear of the transaxle.

Shift Accumulation

1-2/3-4 and 2-3 Accumulator Valves: Line pressure is regulated into accumulator fluid pressure. This regulation is basically controlled by torque signal fluid pressure acting on the end of the valve.

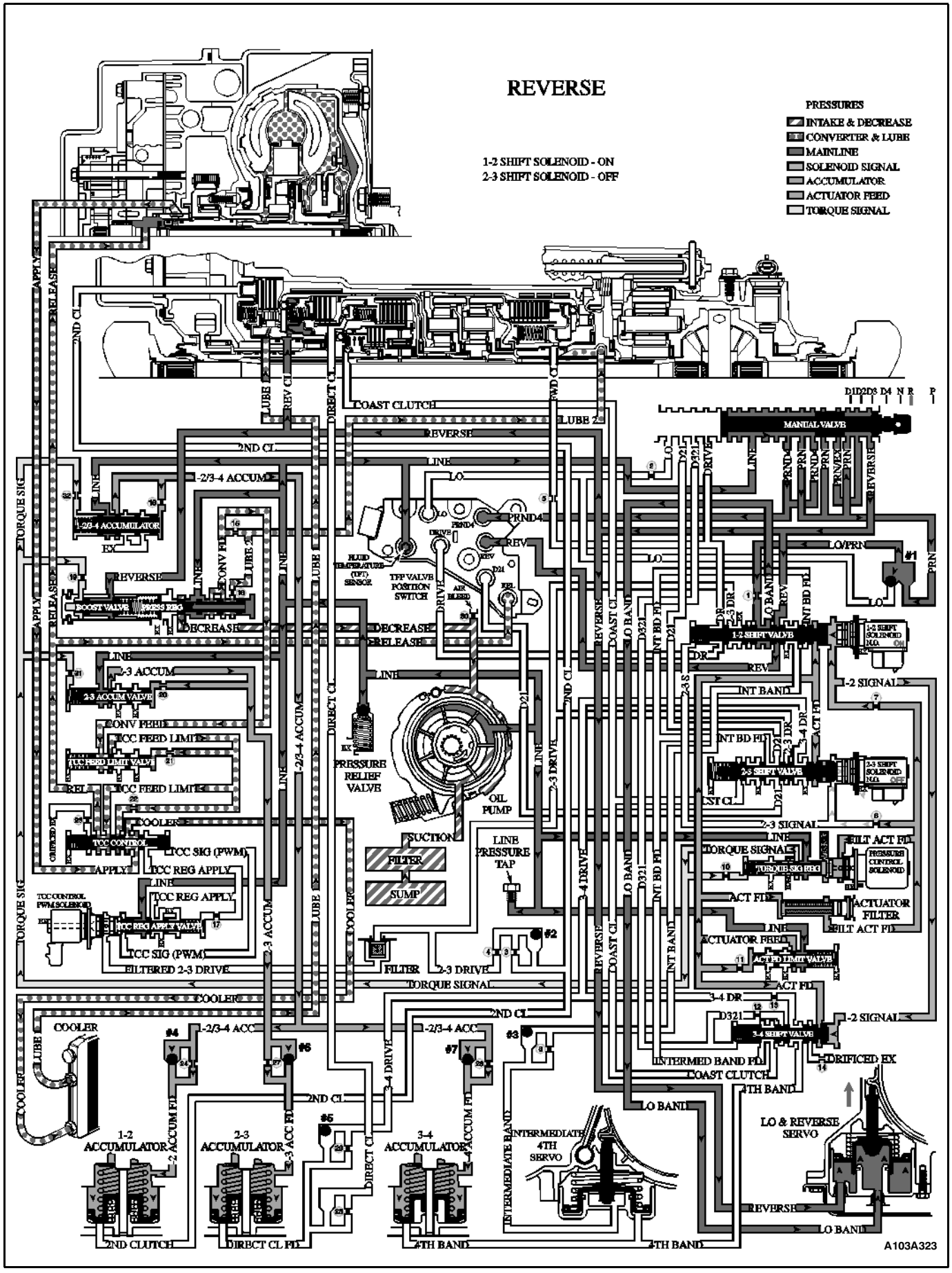
1-2, 2-3 and 3-4 Accumulator Assemblies: Accumulator fluid is routed to each of the accumulator assemblies in preparation for upshifts. The fluid routed to the 1-2 and 3-4 accumulators is orificed by the #4 and #7 checkballs. The 2-3 accumulator fluid circuit is orificed by checkball #6.

Torque Converter/Cooler and Lube Circuits

Refer to reverse (R) range for a complete description of these circuits.

Important: Actuator feed fluid continues to feed the 2-3 signal fluid circuit through orifice #6. However, the exhaust port through 2-3 shift solenoid is larger than orifice #6 to prevent a pressure increase in the 2-3 signal fluid circuit.

REVERSE


REVERSE
PRESSURES
INTAKE & DECREASE
CONVERTER & LUBE
MAINLINE
SOLENOID SIGNAL
ACCUMULATOR
ACTUATOR FEED
TORQUE SIGNAL
1-2 SHIFT SOLENOID - ON
2-3 SHIFT SOLENOID - OFF
MANUAL VALVE
1-2 SHIFT VALVE
2-3 SHIFT VALVE
3-4 SHIFT VALVE
TCC CONTROL
TCC REG APPLY VALVE
ACTFED LIMIT VALVE
TORQUE SIG REG
PRESSURE CONTROL SOLENOID
ACTUATOR FILTER
1-2 ACCUMULATOR
2-3 ACCUMULATOR
3-4 ACCUMULATOR
LO & REVERSE SERVO
INTERMEDIATE 4TH SERVO
PRESSURE RELIEF VALVE
OIL PUMP
FILTER
SUMP
LINE PRESSURE TAP
TFP VALVE POSITION SWITCH
FLUID TEMPERATURE (TFT) SENSOR
COOLER
2ND CLUTCH
DIRECT CL FD
4TH BAND
INTERMED BAND FD
COAST CLUTCH
LO BAND
REVERSE
A103A323

When the gear selector lever is moved to the reverse (R) position (from the park position), the following changes occur in the transaxle's hydraulic and electrical systems.

Pressure Regulation

Manual Valve: With the manual valve in the reverse position, line pressure is directed into the reverse fluid circuit, in addition to the PRND4 and PRN fluid circuits as in park.

Pressure Regulator and Boost Valves: Reverse fluid is routed to the boost valve and assists torque signal fluid pressure. The addition of reverse fluid pressure increases the operating range of line pressure in reverse.

TFP: Reverse fluid is routed through the 1-2 shift valve and to the TFP. The TFP signals the TCM that the transaxle is in reverse.

Reverse Clutch Applies

Reverse Clutch: Reverse clutch fluid pressure applies the reverse clutch.

Lo and Reverse Band Remains Applied

1-2 Shift Solenoid: The TCM keeps the solenoid energized in reverse and 1-2 signal fluid pressure acts on the 1-2 shift valve.

1-2 Shift Valve: 1-2 signal fluid pressure keeps the 1-2 shift valve in the downshifted position. Lo/PRN fluid continues to feed the lo band fluid circuit.

Lo and Reverse Servo: Reverse fluid is routed to the outer area of the servo to increase the servo apply pressure in reverse.

Torque Converter Clutch

Pressure Regulator Valve: Line pressure is routed through the PR valve and into the converter feed fluid circuit. Converter feed fluid is routed to the TCC feed limit valve.

TCC Feed Limit Valve: Converter feed fluid is routed through the valve and into the TCC feed limit fluid circuit. The TCC feed limit valve limits the maximum fluid pressure in the TCC feed limit fluid circuit and the torque converter.

TCC Regulated Apply Valve: Spring force holds the valve in the release position, thereby blocking line pressure.

TCC Control Valve: Spring force holds the valve in the release position and TCC feed limit fluid is routed into the release fluid circuit. Also, fluid returning from the converter in the apply fluid circuit is routed through the valve and into the cooler fluid circuit.

Torque Converter: Release fluid pressure is routed to the torque converter to keep the TCC released. Fluid leaves the converter in the apply fluid circuit.

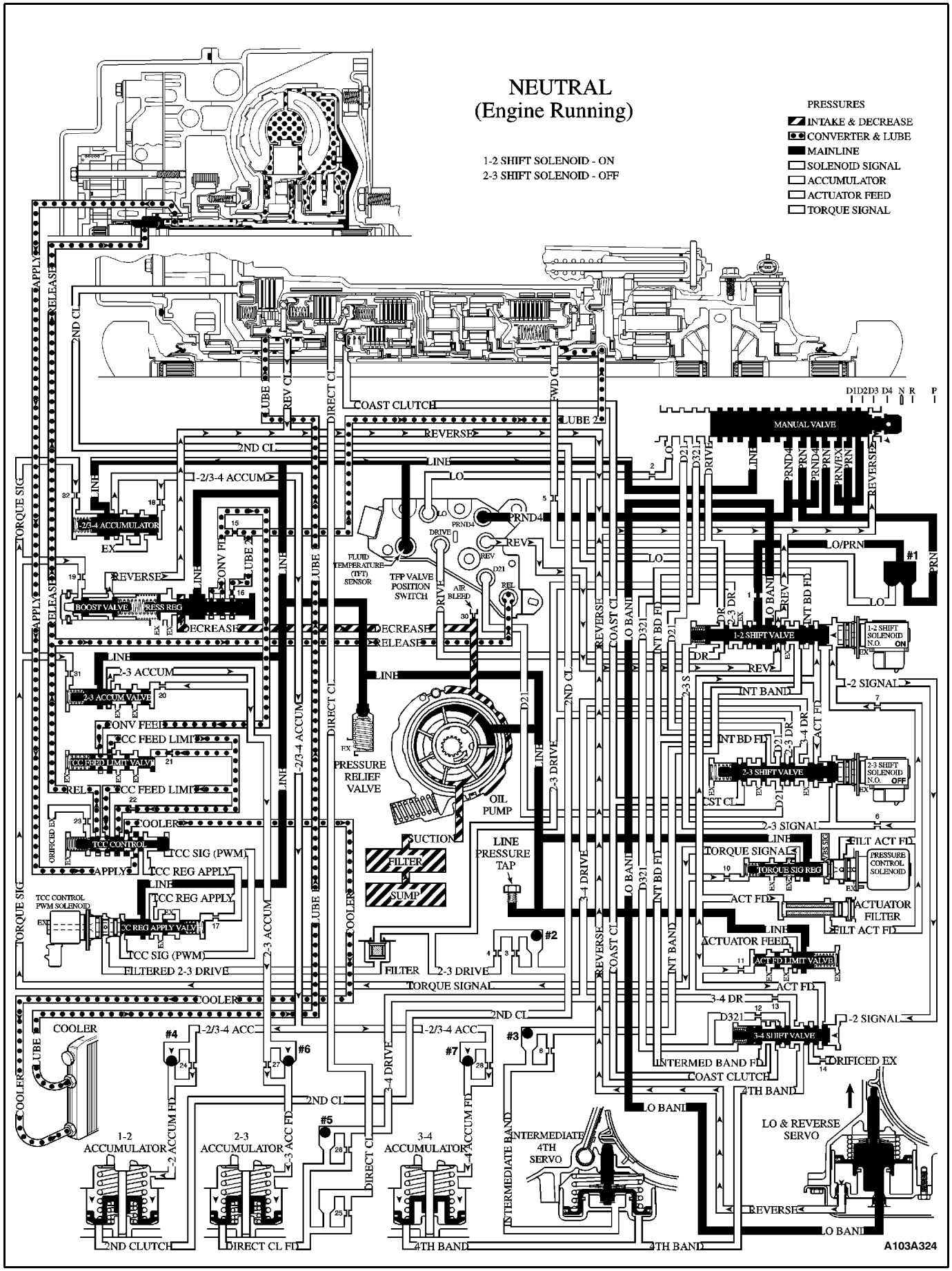
Cooler and Lube

Lube 1: Cooler fluid is routed through the transaxle oil cooler located in the vehicle radiator and into the lube 1 fluid circuit. Lube 1 fluid is routed through the input shaft to lubricate transaxle components in the front of the transaxle.

Lube 2: The lube 2 fluid circuit is fed by line pressure at the pressure regulator valve. Lube 2 fluid is routed through the oil feed pipes and into the forward clutch support. Lube 2 fluid provides lubrication in the rear of the transaxle.

Important: The explanation in each gear range is, for the most part, limited to what changes from the previous range. However, some component descriptions are repeated for clarity and continuity. Also, refer to the appropriate service manual for specific application information.

NEUTRAL (ENGINE RUNNING)



When the gear selector lever is moved from the reverse position to the neutral position, the following changes occur to the hydraulic and electrical systems.

Reverse Clutch Releases

Manual Valve: The manual valve is moved to the neutral position and blocks line pressure from entering the reverse fluid circuit. The reverse fluid circuit is opened to an exhaust at the manual valve.

Reverse Clutch: Reverse fluid exhausts from the reverse clutch and the clutch releases, shifting the transaxle into neutral.

Boost Valve: Reverse fluid exhausts from the boost valve and line pressure regulation returns to the normal operating range.

TFP: Reverse fluid pressure exhausts from the TFP, thereby signalling the TCM that the transaxle is in neutral (N) or park (P).

Lo and Reverse Band Remains Applied

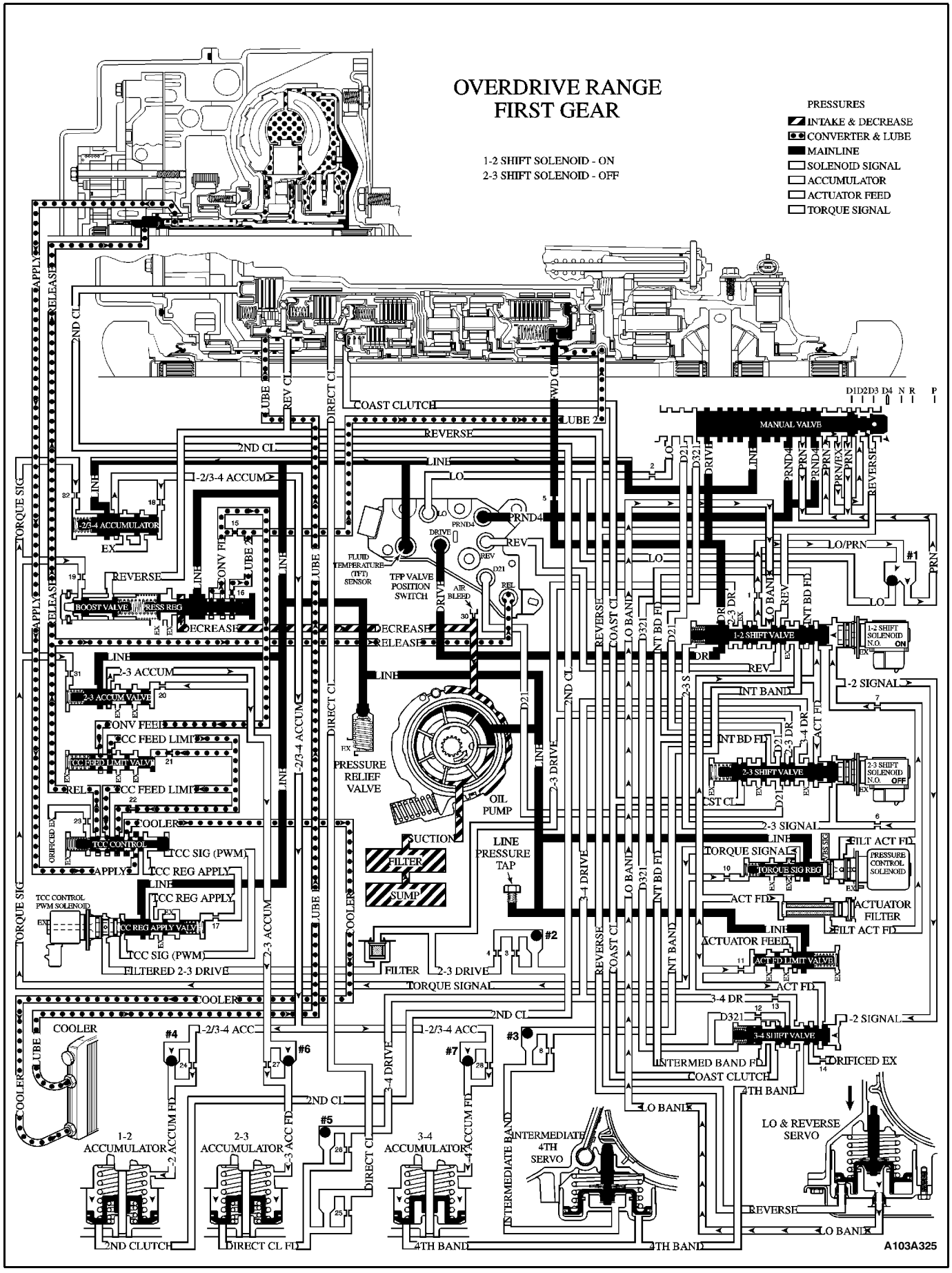
1-2 Shift Solenoid: As in park and reverse, the solenoid is energized and 1-2 signal fluid pressure acts on the 1-2 shift valve.

1-2 Shift Valve: 1-2 signal fluid pressure keeps the 1-2 shift valve in the downshifted position. Lo/PRN fluid continues to feed the lo band fluid circuit.

Lo and Reverse Servo: Reverse fluid exhausts from the servo. However, lo band fluid pressure continues to act on the inner area of the servo piston to keep the band applied.

Important: In park, reverse and neutral, the shift solenoids are shown in the first gear state. This is the normal operating state when the vehicle is stationary or at low vehicle speeds. However, the TCM will change the shift solenoid states depending on vehicle speed. For example, if neutral range is selected when the vehicle is operating in second gear, the shift solenoids will remain in a second gear state. But with the manual valve in neutral, line pressure is blocked, drive fluid exhausts and the transmission will shift into neutral.

OVERDRIVE RANGE - FIRST GEAR



When the gear selector lever is moved to the overdrive (D) position from the neutral (N) position, the following changes occur to shift the transaxle into overdrive range - first gear.

Manual Valve: In the overdrive position the manual valve routes line pressure into the drive fluid circuit. Also, the manual valve blocks line pressure from entering the PRN fluid circuit and opens the PRN fluid circuit to exhaust.

Low and Reverse Band Releases

Lo and Reverse Servo: Lo band fluid pressure exhausts from the servo, thereby releasing the servo and the lo and reverse band.

Forward Clutch Applies

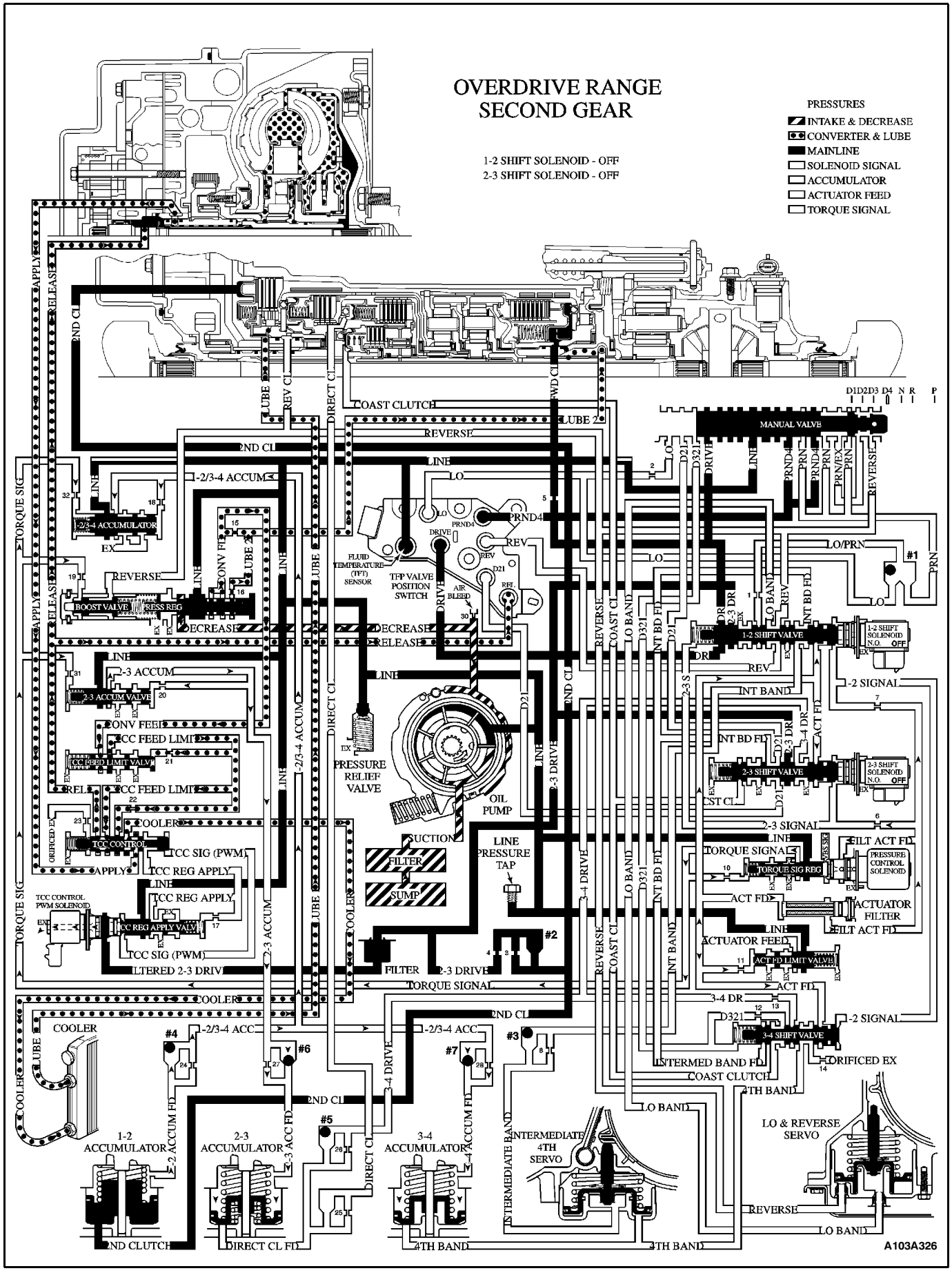
Forward Clutch: Drive fluid is orificed into the forward clutch fluid circuit. Forward clutch fluid pressure applies the forward clutch.

1-2 Shift Solenoid: In first gear 1-2 shift solenoid remains energized by the TCM and 1-2 signal fluid pressure acts on the 1-2 shift valve.

1-2 Shift Valve: 1-2 signal fluid pressure keeps the 1-2 shift valve in the downshifted position against spring force. Drive fluid is routed through the 1-2 shift valve.

TFP: Drive fluid is routed to the TFP and the TFP signals the TCM that the transaxle is in the overdrive range.

OVERDRIVE RANGE - SECOND GEAR



As vehicle speed increases and operating conditions become appropriate, the TCM de-energizes shift 1-2 solenoid to shift the transaxle into second gear. The manual valve remains in the overdrive (D) position and line pressure is routed into the drive and PRND4 fluid circuits.

Second Clutch Applies

1-2 Shift Solenoid: The normally open shift solenoid is de-energized and 1-2 signal fluid exhausts through the open solenoid.

Important: Filtered actuator feed fluid continues to feed the 1-2 signal fluid circuit through orifice #7. However, the exhaust port through the solenoid is larger than orifice #7 to prevent a pressure increase in the 1-2 signal fluid circuit.

1-2 Shift Valve: With 1-2 signal fluid pressure exhausted, spring force moves the valve into the upshifted position and drive fluid is routed into the 2-3 drive fluid circuit. Drive fluid also continues to flow through the valve and to the TFP.

#2 Checkball (Second Clutch Apply): 2-3 drive fluid seats the #2 checkball, forces 2-3 drive fluid through the #3 orifice and feeds the 2nd clutch fluid circuit. The #3 and #4 orifices help control the apply feel of the second clutch.

Second Clutch: 2nd clutch fluid pressure applies the second clutch to shift the transaxle into second gear.

Shift Accumulation

1-2 Accumulator: 2nd clutch fluid is also routed to the 1-2 accumulator piston. Second clutch fluid pressure, in addition to 1-2 assist spring force, moves the piston against spring force and 1-2 accumulator feed fluid pressure. This action absorbs initial 2nd clutch fluid pressure to cushion the second clutch apply. The movement of the 1-2 accumulator piston forces some accumulator fluid out of the accumulator.

1-2 Accumulator Valve: 1-2 accumulator feed fluid forced from the 1-2 accumulator unseats the #4 checkball and is routed back to the 1-2 accumulator valve. This pressure forces the 1-2 accumulator valve against spring force and torque signal fluid pressure to regulate the exhaust of excess accumulator fluid. This regulation provides additional control for the second clutch apply. Figure 39 shows the exhaust of accumulator fluid during the shift by the arrow directions in the accumulator fluid circuit.

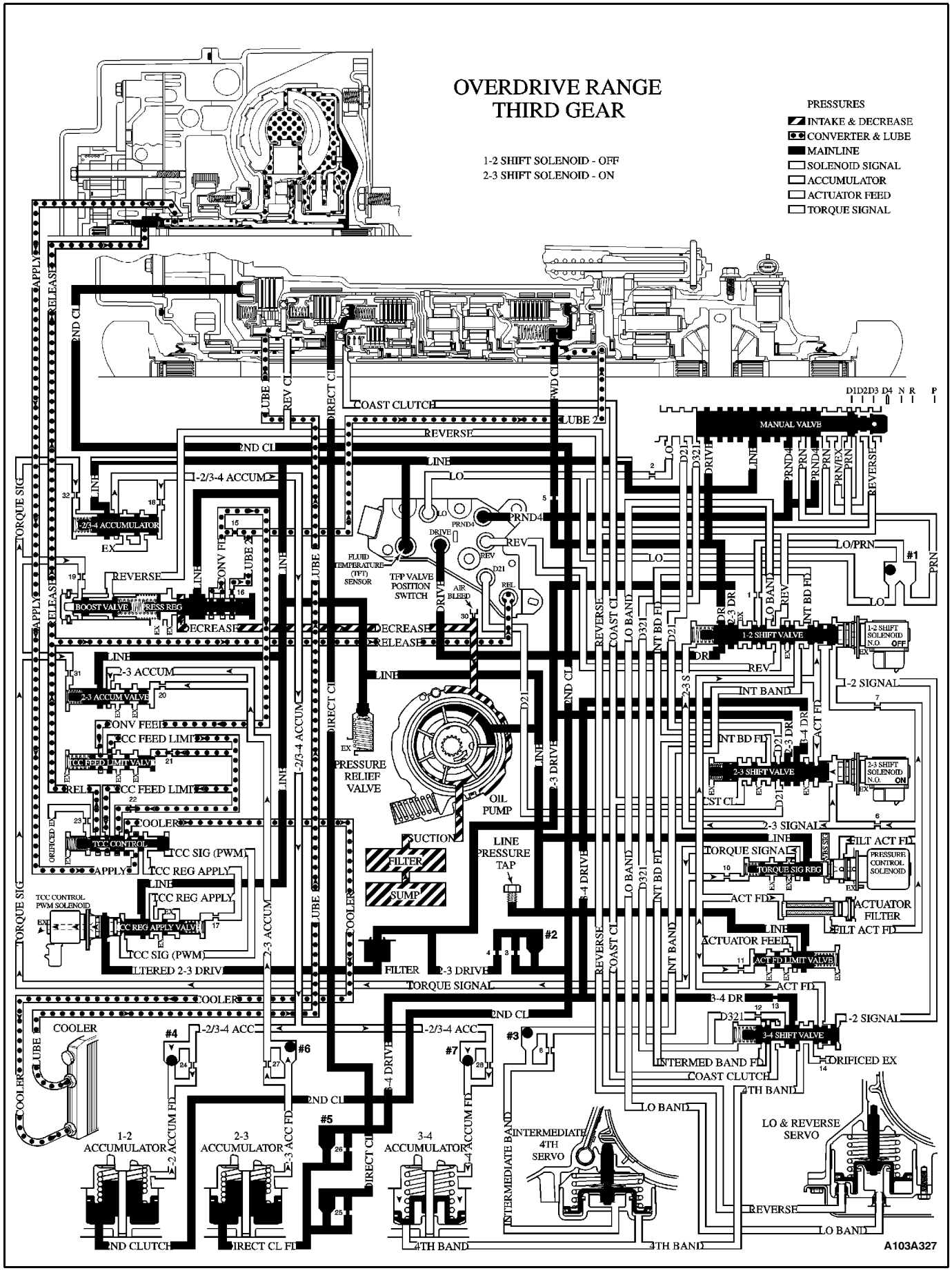
TCC Control - Pulse Width Modulated (PWM) Solenoid: Filtered 2-3 drive fluid is routed to the TCC control solenoid. Under normal operating conditions the TCC control solenoid is OFF in second gear and blocks filtered 2-3 drive fluid from entering the TCC signal fluid circuit.

Torque Converter Clutch: With the TCC control solenoid OFF ,the converter clutch is released in second gear.

2-3 Shift Solenoid: 2-3 shift solenoid remains OFF in second gear and 2-3 signal fluid exhausts through the normally open solenoid.

2-3 Shift Valve: Spring force keeps the 2-3 shift valve in the downshifted position. In this position the valve blocks 2-3 drive fluid in preparation for the upshift to third gear.

OVERDRIVE RANGE - THIRD GEAR



As vehicle speed increases and operating conditions become appropriate, the TCM energizes 2-3 shift solenoid to shift the transaxle into third gear. The manual valve remains in the overdrive (D) position and line pressure continues to feed the drive and PRND4 fluid circuits.

Direct Clutch Applies

2-3 Shift Solenoid: The normally open shift solenoid is energized by the TCM and blocks 2-3 signal fluid from exhausting. 2-3 signal fluid pressure is routed to both the 1-2 and 2-3 shift valves.

2-3 Shift Valve: 2-3 signal fluid pressure moves the valve against spring force to initiate the 2-3 upshift. 2-3 drive fluid is routed through the valve and into the 3-4 drive fluid circuit.

#5 Checkball (Direct Clutch Apply): 3-4 drive fluid pressure seats the #5 checkball and 3-4 drive fluid is forced through the #26 orifice and into the direct clutch feed fluid circuit. The #26 orifice helps control the direct clutch apply.

Direct Clutch: Direct clutch fluid pressure applies the direct clutch and the transaxle shifts into third gear.

3-4 Shift Valve: 3-4 drive fluid is also routed to the 3-4 shift valve in preparation for a 3-4 upshift.

Shift Accumulation

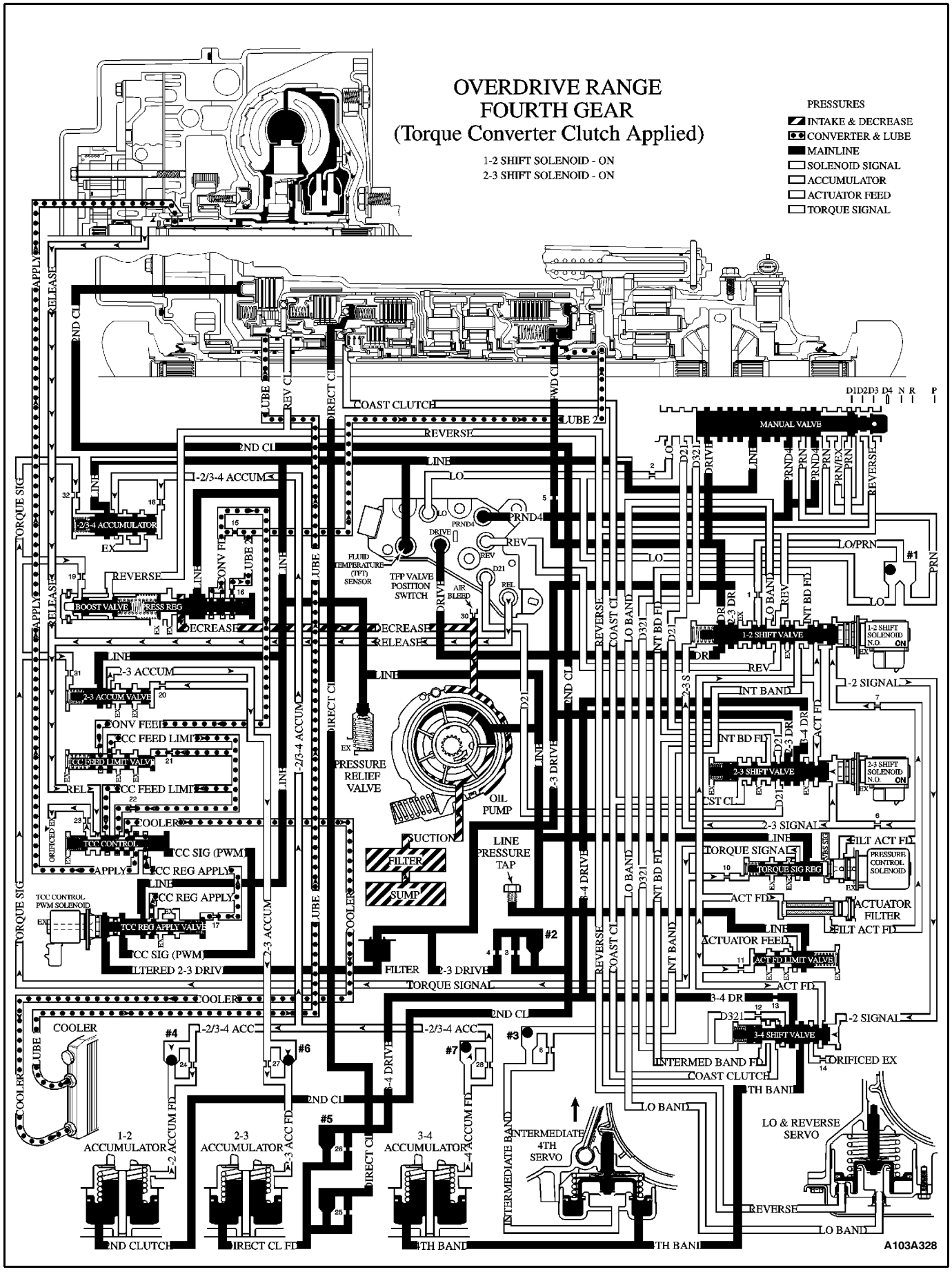
2-3 Accumulator: Direct clutch feed fluid is also routed to the 2-3 accumulator piston. This fluid pressure moves the piston against spring force and 2-3 accumulator feed fluid pressure. This action absorbs initial direct clutch fluid pressure to cushion the direct clutch apply. The movement of the 2-3 accumulator piston forces some accumulator fluid out of the accumulator.

2-3 Accumulator Valve: Excess 2-3 accumulator feed fluid unseats the #6 checkball and is routed back to the 2-3 accumulator valve. This fluid pressure moves the accumulator valve against spring force and torque signal fluid pressure to regulate the exhaust of excess accumulator fluid. This regulation provides additional control for the direct clutch apply. The overdrive range - 4-3 downshift illustration shows the exhaust of accumulator fluid during the shift by the arrow directions in the accumulator fluid circuit.

Torque Converter Clutch: Under normal operating conditions the TCC is released in third gear. However, TCC apply could vary depending on vehicle application and may be calibrated to apply in overdrive range - third gear.

TFP: Release fluid pressure routed to the TFP signals the TCM that the TCC is released.

OVERDRIVE RANGE - FOURTH GEAR



When operating conditions are appropriate, the TCM energizes 1-2 shift solenoid to shift the transaxle into fourth gear. In addition, the TCC is applied in fourth gear. The manual valve remains in the overdrive position and line pressure continues to feed the Drive and PRND4 fluid circuits.

Intermediate and 4th Band Applied

1-2 Shift Solenoid: The normally open shift solenoid is energized by the TCM and blocks 1-2 signal fluid from exhausting. 1-2 signal fluid pressure is routed to both the 1-2 and 3-4 shift valves.

1-2 Shift Valve: 1-2 signal fluid pressure does not affect the 1-2 shift valve. Spring force and 2-3 signal fluid pressure keep the 1-2 shift valve in the upshifted position.

3-4 Shift Valve: 1-2 signal fluid pressure moves the valve against spring force and into the fourth gear position. 3-4 drive fluid is routed into the 4th band fluid circuit.

Intermediate and 4th Servo: 4th band fluid pressure acts on the outer area of the servo piston to move the servo pin and apply the intermediate/4th band.

Shift Accumulation

3-4 Accumulator: 4th band fluid is also routed to the 3-4 accumulator piston. 4th band fluid pressure moves the piston against spring force and 3-4 accumulator feed fluid pressure. This action absorbs initial 4th band fluid pressure to cushion the intermediate/4th band apply. The movement of the 3-4 accumulator piston forces some accumulator fluid out of the accumulator.

3-4 Accumulator Valve: 3-4 accumulator feed fluid forced from the 3-4 accumulator unseats the #7 checkball and is routed back to the 3-4 accumulator valve. This pressure forces the 1-2/3-4 accumulator valve against spring force and torque signal fluid pressure to regulate the exhaust of excess accumulator fluid. This regulation provides additional control for the intermediate/4th band apply. The manual third - third gear illustration shows the exhaust of accumulator fluid during the shift by the arrow directions in the accumulator fluid circuit.

Torque Converter Clutch Applied

TCC Control Solenoid: When conditions are appropriate, the TCM energizes the TCC control solenoid to initiate the TCC apply. The solenoid is pulse width modulated (PWM) to provide a smooth TCC apply (refer to the electrical controls section for a detailed description of the TCC control solenoid operation). When energized, the solenoid modulates filtered 2-3 drive fluid into the TCC signal fluid circuit.

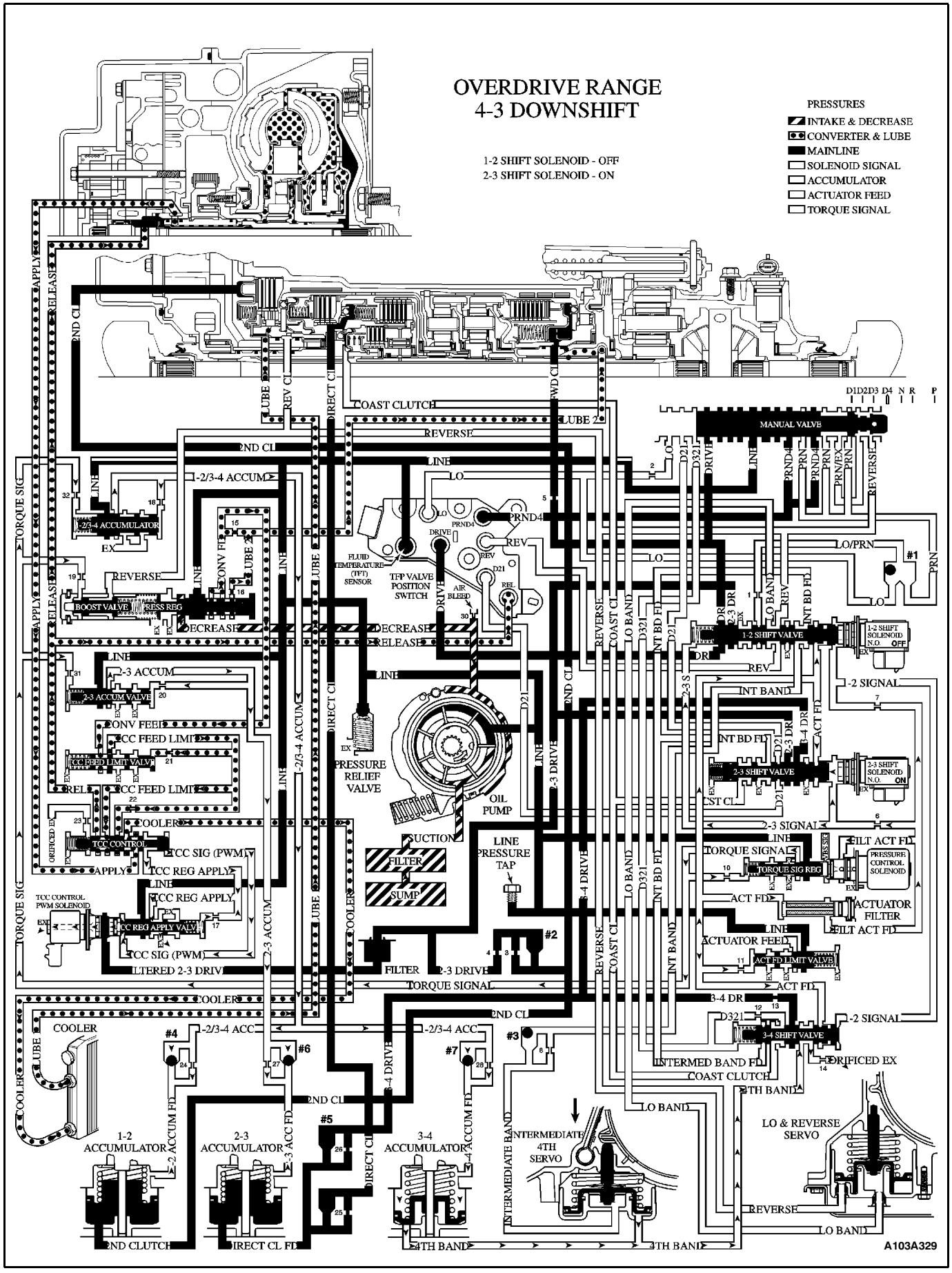
TCC Regulated Apply Valve: TCC signal fluid pressure modulates the valve against spring force and TCC regulated apply fluid pressure. This action directs line pressure into the TCC regulated apply fluid circuit in relation to vehicle operating conditions.

TCC Control Valve: Modulated TCC signal fluid pressure moves the valve against spring force in relation to vehicle operating conditions. This action regulates TCC regulated apply fluid into the apply fluid circuit. At the same time, the release fluid circuit is opened to an orificed exhaust. In this position the valve directs TCC feed limit fluid to feed the cooler fluid circuit.

Torque Converter Clutch: Apply fluid is routed to the torque converter at the same time release fluid exhausts from the converter. Apply fluid pressure applies the TCC.

TFP: Release fluid also exhausts from the TFP and the TFP signals the TCM that the TCC is released.

OVERDRIVE RANGE - 4-3 DOWNSHIFT



When the transaxle is operating in overdrive range - fourth gear, a forced 4-3 downshift will occur if there is a significant increase in throttle position. At minimum throttle, vehicle speed will decrease gradually (coast-down) and the TCM will command a 4-3 downshift. The TCM will also initiate a 4-3 downshift if engine load is increased with throttle position remaining the same (for example, driving up a steep hill).

Line Pressure Increases

Pressure Control Solenoid (PCS): During the downshift, except for a coastdown, the TCM senses the increase in throttle position or engine load and increases the PCS duty cycle. The increase in duty cycle increases output fluid pressure from the PCS, thereby increasing torque signal fluid pressure at the torque signal regulator valve.

Pressure Regulator Valve: Increased torque signal fluid pressure acting on the boost valve increases line pressure at the pressure regulator valve.

Intermediate/4th Band Releases

1-2 Shift Solenoid: The TCM de-energizes the normally open solenoid and 1-2 signal fluid exhausts.

3-4 Shift Valve: 1-2 signal fluid pressure exhausts from the 3-4 shift valve and spring force moves the valve into the third gear position. This opens the 4th band fluid circuit to an orificed exhaust to help control the band release.

Intermediate/4th Servo: 4th band fluid exhausts from the servo and spring force moves the servo to the release position, thereby releasing the band.

3-4 Accumulator: 4th band fluid exhausts from the accumulator. Spring force and 3-4 accumulator feed fluid pressure move the accumulator piston to the third gear position.

1-2/3-4 Accumulator Valve: The accumulator valve regulates line pressure into the 1-2/3-4 accumulator fluid circuit to fill the 3-4 accumulator. This regulation is basically controlled by torque signal fluid pressure. Increased torque signal fluid pressure regulates accumulator fluid to a higher pressure.

#7 Checkball (3-4 Accumulator): 1-2/3-4 accumulator fluid pressure seats the *#7* checkball and forces accumulator fluid through orifice #28.

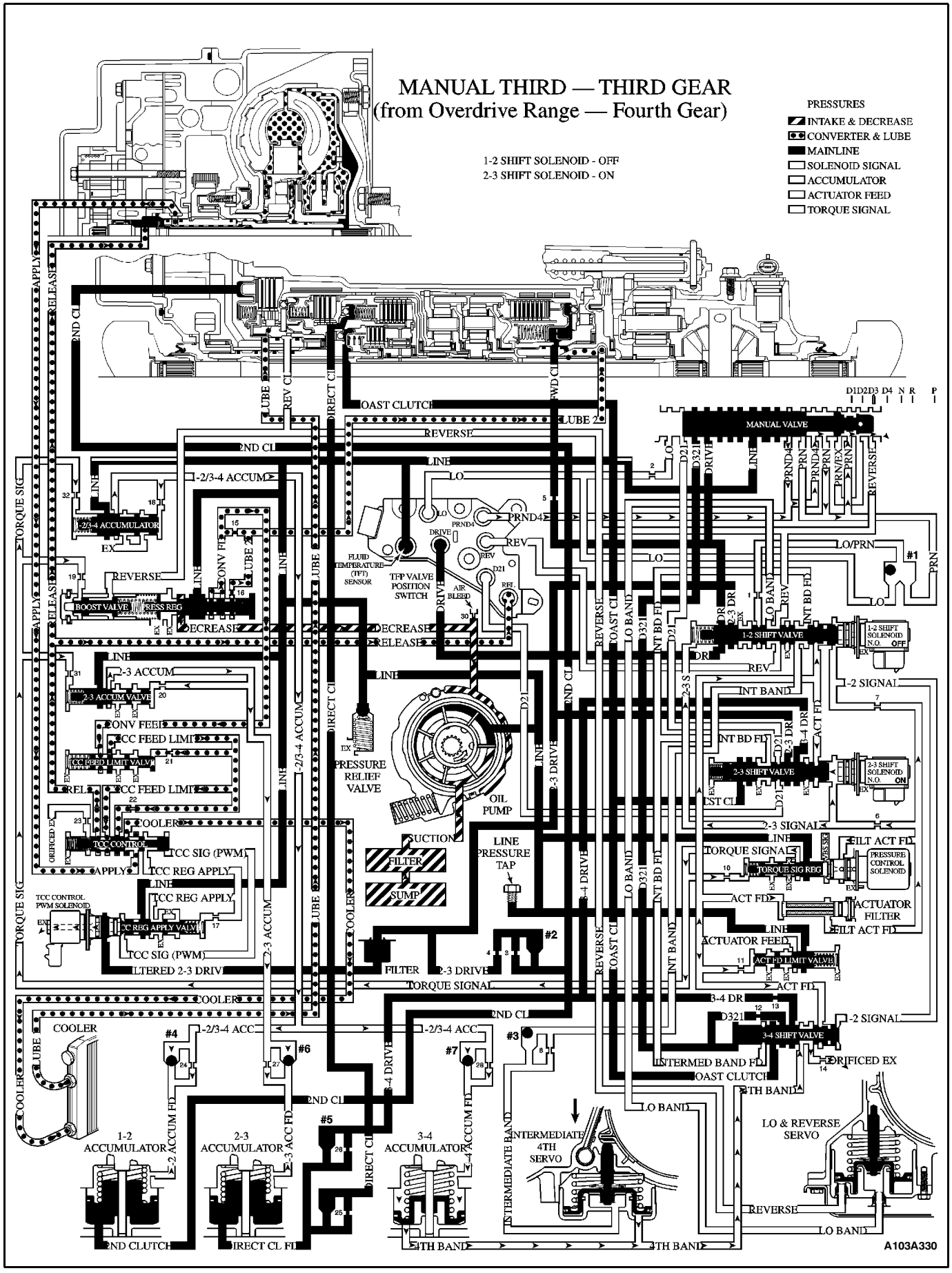
Torque Converter Clutch

The TCM commands TCC release prior to initiating a 4-3 downshift. When the TCC is in the release position, release fluid pressure is routed to the pressure switch assembly. This fluid pressure signals the TCM that the TCC is in the release position. The TCC is not applied under normal operating conditions in third gear (except for some applications).

3-2 and 2-1 Downshifts

Refer to the manual range explanations for a description of the 3-2 and 2-1 downshifts with respect to the clutches releasing.

MANUAL THIRD - THIRD GEAR



A manual 4-3 downshift is accomplished by moving the gear selector lever to the manual third (3) position. In manual third, the transaxle is hydraulically prevented from upshifting into fourth gear under any conditions. Also, the coast clutch is applied in all manual ranges to provide engine compression braking when appropriate. The following information explains the additional changes during a manual 4-3 downshift as compared to a forced 4-3 downshift. Refer to Overdrive Range - 4-3 Downshift for a complete description of a 4-3 downshift.

Fourth Gear Hydraulically Prevented

Manual Valve: The manual valve moves into the manual third (3) position and line pressure enters the D321 fluid circuit. Also, the manual valve blocks line pressure from the PRND4 fluid circuit and PRND4 fluid exhausts past the manual valve.

3-4 Shift Valve: D321 fluid pressure assists spring force to keep the valve in the third gear position under any conditions. This opens the 4th band fluid circuit to an orificed exhaust and the intermediate/4th band releases, thereby preventing fourth gear.

Important: The operating states for the shift solenoids follow the normal operation depending on vehicle driving conditions. The manual first - first gear illustration shows the solenoids in the third gear position.

TFP: PRND4 fluid exhausts from the TFP and the TFP signals the TCM that the manual valve is in the manual third position.

Coast Clutch Applies

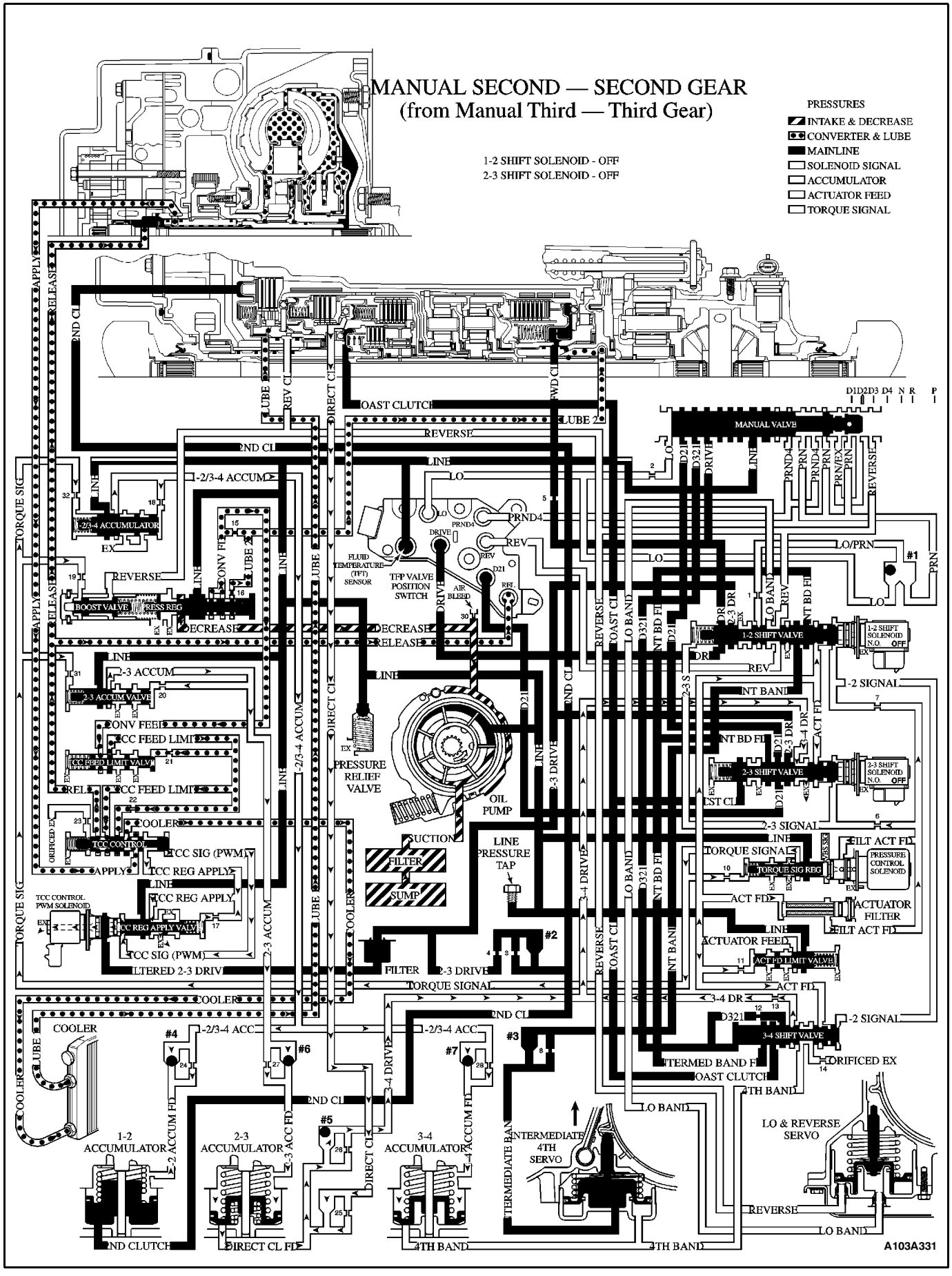
3-4 Shift Valve: D321 fluid is routed through the 3-4 shift valve and into the coast clutch fluid circuit.

Coast Clutch: Coast clutch fluid pressure applies the coast clutch. With the coast clutch applied, engine compression braking is available in manual third - third gear to slow the vehicle when the throttle is released.

Manual Third - Second and First Gears

The transmission operates the same in manual third as in overdrive range with the exception of fourth gear being prevented. The transaxle will upshift and downshift between first, second, and third gears as in overdrive range. However, engine compression braking is not available in manual third - first and second gears and the vehicle will coast when the throttle is released.

MANUAL SECOND - SECOND GEAR



A manual 3-2 downshift is initiated by moving the gear selector lever to the manual second (2) position. However, the transaxle will not downshift into second gear until vehicle speed is below approximately 99 km/h (62 mph). At higher vehicle speeds, the TCM will keep 2-3 shift solenoid energized (ON) and the transaxle will operate in manual second - third gear as a safety precaution. In manual second the transaxle is hydraulically prevented from upshifting into fourth gear under any conditions. Also, the coast clutch remains applied as in manual third and provides engine compression braking in third and second gears. The transaxle upshifts and downshifts between first and second gears as in overdrive range.

Manual Valve: Line pressure is routed into the D21 fluid circuit when the selector lever is moved into the manual second (2) position. Line pressure continues to feed the D321 fluid circuit as in manual third.

2-3 Shift Solenoid: The TCM de-energizes 2-3 shift solenoid when vehicle operating conditions are appropriate for 3-2 downshift. With the solenoid OFF 2-3 signal fluid exhausts through 2-3 shift solenoid.

2-3 Shift Valve: Spring force moves the 2-3 shift valve into the second gear position when 2-3 signal fluid exhausts. D21 fluid continues through the valve and is also routed into the intermediate band feed fluid circuit. 3-4 drive fluid, which feeds the direct clutch, exhausts past the 2-3 shift valve.

Direct Clutch Releases

Direct Clutch: Direct clutch fluid exhausts and the direct clutch releases.

2-3 Accumulator: Direct clutch feed fluid exhausts from the 2-3 accumulator, unseats the #5 checkball and exhausts past the 2-3 shift valve. 2-3 accumulator feed fluid seats the #6 checkball and fluid is routed through orifice #27 to control accumulator feed pressure as direct clutch feed fluid exhausts.

2-3 Accumulator Valve: The accumulator valve regulates line pressure into the 2-3 accumulator fluid circuit to fill the 2-3 accumulator. This regulation is basically controlled by torque signal fluid pressure. Accumulator fluid pressure is regulated to a higher pressure with greater torque signal fluid pressure.

Intermediate/4th Band Applies

1-2 Shift Valve: 1-2 Shift solenoid is OFF when the TCM commands second gear and spring force holds the 1-2 shift valve in the upshifted position. Intermediate band feed fluid is routed through the valve and into the intermediate band fluid circuit.

#3 Checkball (Intermediate Band Apply): Intermediate band fluid pressure seats the #3 checkball and is forced through the #8 orifice. This orifice helps control the intermediate band apply.

Intermediate/4th Servo: Intermediate band fluid pressure is routed to the inner area of the intermediate/4th servo piston. This fluid pressure moves the servo piston and apply pin to apply the intermediate/4th band. The band provides engine compression braking in manual second - second gear.

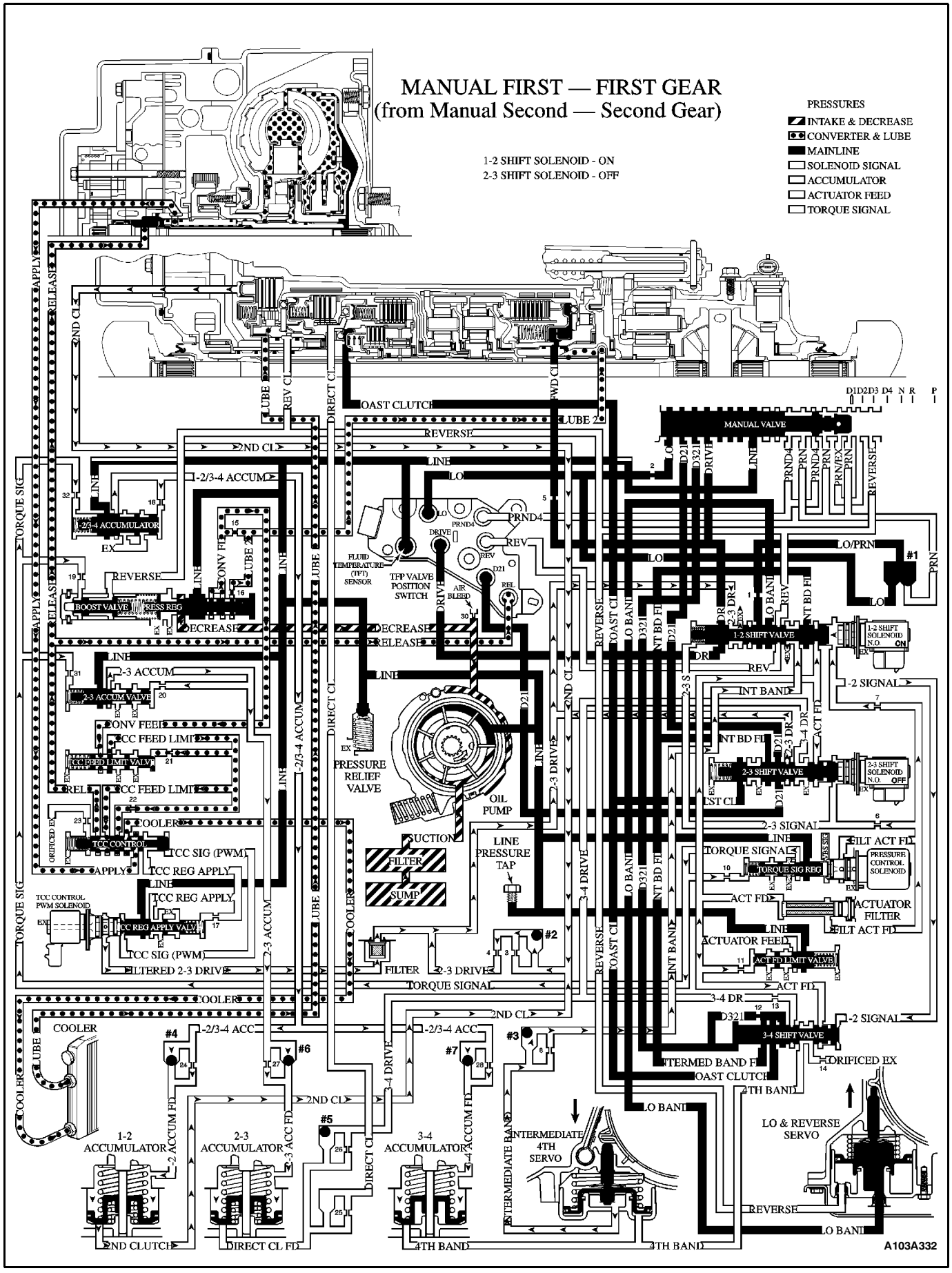
Pressure Control

TFP: D21 fluid from the 2-3 shift valve is routed to the TFP. The TFP signals the TCM that the manual valve is in the manual second position.

Pressure Control Solenoid: The TCM increases the PCS duty cycle to increase the operating range of torque signal fluid pressure in manual second. This provides increased line pressure for the additional torque requirements during engine compression braking and increased engine load in manual second.

Torque Converter Clutch: The TCM will release the TCC before downshifting into manual second. The TCC will not re-apply in second gear under normally operating conditions.

MANUAL FIRST - FIRST GEAR



A manual 2-1 downshift is initiated by moving the gear selector lever to the manual first (1) position. However, the transaxle will not downshift into first gear until vehicle speed is below approximately 60 km/h (37 mph). At higher vehicle speeds the TCM will keep 1-2 shift solenoid de-energized (OFF) and the transaxle will operate in manual first - second gear. In manual first, the transaxle is electronically prevented from upshifting into third or fourth gears under any conditions. Also, the coast clutch remains applied, as in manual third and manual second, and provides engine compression braking in first and second gears.

Manual Valve: Line pressure is routed into the LO fluid circuit when the selector lever is moved into the manual first (1) position. Line pressure continues to feed the drive, D321 and D21 fluid circuits as in manual second.

TFP: LO fluid pressure is routed to the TFP and the TFP signals the TCM that the manual valve is in the manual first position.

#1 Checkball (LO/PRN): LO fluid pressure seats the #1 checkball against the PRN fluid circuit and fills the LO/PRN fluid circuit. LO/PRN fluid is routed to the 1-2 shift valve.

1-2 Shift Solenoid: 1-2 shift solenoid is energized by the TCM when vehicle speed is below approximately 30 to 35 mph. 1-2 signal fluid is blocked from exhausting through the solenoid.

1-2 Shift Valve: 1-2 signal fluid pressure shifts the valve into the downshifted position against spring force and the following changes occur:

- The 2-3 drive fluid circuit is open to an exhaust past the valve.
- Intermediate band fluid is exhausted past the valve.
- LO/PRN fluid is routed into the lo band fluid circuit.

Second Clutch Releases

Second Clutch: 2nd clutch fluid exhausts from the clutch piston and through the 2-3 drive fluid circuit. This releases the 2nd clutch and the transaxle operates in first gear.

1-2 Accumulator: 2nd clutch feed fluid exhausts from the 1-2 accumulator, exhausts past the #2 checkball and through the 2-3 drive fluid circuit. 1-2 accumulator feed fluid fills the 1-2 accumulator as 2nd clutch fluid exhausts.

1-2/3-4 Accumulator Valve: The accumulator valve regulates line pressure into the 1-2/3-4 accumulator fluid circuit to fill the 1-2 accumulator. This regulation is basically controlled by torque signal fluid pressure. Accumulator fluid pressure is regulated to a higher pressure with greater torque signal fluid pressure.

TCC Control Solenoid: Filtered 2-3 drive fluid exhausts from the solenoid and through the 2-3 drive fluid circuit.

Intermediate Band Releases

Intermediate/4th Servo: Intermediate band fluid exhausts from the servo piston, spring force moves the piston and apply pin and the intermediate/4th band releases. However, the intermediate/4th band remains applied in manual first - second gear to achieve engine compression braking.

Lo/Reverse Band Applies

Lo/Reverse Servo: Lo/band fluid pressure is routed to the inner area of the lo/reverse servo to apply the lo/reverse band. The lo/reverse band provides engine compression braking when the throttle is released in manual first - first gear.

Important: Manual first - third gear is also possible at high speeds as a safety feature.